48ZA,ZE,ZJ030-105
48ZC,ZL,ZR,ZT,ZV,ZW075-105
Single Package Gas Heating and Electric Cooling Units with Direct Spark Ignition

Installation, Start-Up and Service Instructions

CONTENTS

Page

GENERAL 2
SAFETY CONSIDERATIONS 2
INSTALLATION 3-62
Jobsite Survey 3
Unit Placement 3
Roof Mount 3
Slab Mount 3
Curb Gasketing 3
Field-Fabricated Ductwork 3
Rigging 3
Condensate Drain Connections 24
Install Outdoor Hoods (48ZA,ZC,ZE,ZJ,ZL,ZR Units) 36
- UNIT SIZES 030-050
- UNIT SIZES 055-105

Install Economizer Hoods (48ZT,ZV,ZW Units) . . . 36
- INSTALL SMALL HOODS
- INSTALL LARGE HOODS

Field Wire Routing 39
- UNIT SIZES 030-050
- UNIT SIZES 055-105

Field Electrical Connections 39
- POWER WIRING

Air Pressure Tubing 54
Supply-Fan Shipping Brackets 56
- UNIT SIZES 030-050
- UNIT SIZES 055-070
- UNIT SIZES 075-105

Return/Exhaust Fan Shipping Brackets (48ZC,ZL,ZR Units) 56
Compressor Mounting 58
Install Accessories 58
CONTROLS INSTALLATION 63-82
Constant Volume Units 63
- CONTROL WIRING

Variable Air Volume Units 63
- CONTROL WIRING, VARIABLE AIR VOLUME UNITS

PIC Control Wiring 66
Supply Air Thermistors (Staged Gas Units Only) 72
Carrier Comfort Network (CCN) Interface 72
Smoke Control Modes 73
Gas Piping 79
Optional Staged Gas Control 79
Installing Flue/Inlet Hoods 80
PRE-START-UP 82-97
System Check 82
25% Outdoor-Air Damper 83
Economizer Inlet Screens 83
Economizer Dampers 83
Gas Manifold Pressure 83

Page

Compressor Oil 83
Supply-Fan Belts, Pulleys, and Sheaves 83
Manual Outdoor-Air Inlet Adjustments 96
Economizer Settings (48ZA,ZC,ZT Only) 96
START-UP 97-101
Initial Check (Constant Volume Units) 97
General 97
Operating Sequences 97
- COOLING, UNITS WITHOUT ECONOMIZER
- HEATING, UNITS WITH DIRECT SPARK IGNITION
- HEATING, UNITS WITH STAGED GAS CONTROL
- COOLING, UNITS WITH ECONOMIZER
- VENTILATION AIR CIRCULATION (Continuous Fan)
- AUTOMATIC CHANGEOVER USING AUTOMATIC CHANGEOVER THERMOSTAT
- POWER EXHAUST
- NON-MODULATING POWER EXHAUST (CV Units Only)
- MODULATING POWER EXHAUST (CV Units Only)
- RETURN/EXHAUST FAN POWER EXHAUST (CV Units With Return/Exhaust Fan Only)
- HIGH-CAPACITY MODULATING POWER EXHAUST

Head Pressure Control 101
High-Capacity Power Exhaust Building Pressure Control Set Point (48ZV,ZW Units Only) 101
SERVICE 102-113
Optional Staged Gas Unit Control 102
- ACCESSORY NAVIGATOR DISPLAY
- CLEARING UNIT ALARMS

Service Access 103
- COMPRESSORS
- LIQUID SERVICE VALVES, FILTER DRIERS, AND SIGHT GLASSES
- SUPPLY-FAN MOTORS, PULLEYS, AND BELTS
- POWER EXHAUST MOTORS, PULLEYS, AND BELTS
- RETURN AIR FILTERS
- UNIT CONTROL BOX
- GAS HEAT SECTION
- MAIN BURNERS
- FLUE GAS PASSAGEWAYS
- COMBUSTION-AIR BLOWERS
- ECONOMIZER DAMPER MOTOR
- CONDENSER FANS AND FAN MOTORS
- INLET GUIDE VANE MOTOR
- 25% OUTDOOR-AIR DAMPER
- MODULATING POWER EXHAUST DAMPER MOTOR
- RETURN-AIR FILTERS

Adjustments 106
- RETURN/EXHAUST FAN MOTOR PLATE

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

CONTENTS (cont)

Page

- SUPPLY FAN AND POWER EXHAUST MOTOR PLATE
- RETURN/EXHAUST BUILDING PRESSURE SWITCH
- MODULATING POWER EXHAUST DIFFERENTIAL PRESSURE SWITCH
- INLET GUIDE VANE DIFFERENTIAL PRESSURE SWITCH (Units With Optional Inlet Guide Vanes and Static Pressure Control)
- POWER EXHAUST INTERLOCK
- SWITCH ADJUSTMENT
- BELT INSTALLATION AND TENSIONING
- PULLEY ALIGNMENT
- INSTALLING REPLACEMENT MOTOR PULLEY (Supply Fan Only)
- CONDENSER FAN ADJUSTMENT (Units Without High Capacity Evaporator Coil)
- CONDENSER FAN ADJUSTMENT (Sizes 050,070,075 with High Capacity Evaporator Coil Option)

Cleaning 109
Lubrication 109
- COMPRESSORS
- FAN SHAFT BEARINGS
- INLET GUIDE VANE BEARINGS (Units With Optional Inlet Guide Vanes)
- FAN MOTOR BEARINGS
- DOOR HINGES

Refrigerant Feed Components 109
Thermostatic Expansion Valve (TXV) 109
Refrigeration Circuits 111
Oil Charge 111
Gas System Adjustment 111
- GAS VALVE ADJUSTMENT
- MAIN BURNERS
- MAIN BURNER REMOVAL AND REPLACEMENT

Moisture/Liquid Indicator 112
Filter Drier 112
Liquid Line Service Valve 112
Compressor Discharge Service Valve 112
Compressor Suction Service Valve 112
Protective Devices 112
- COMPRESSOR PROTECTION
- EVAPORATOR-FAN MOTOR PROTECTION
- CONDENSER-FAN MOTOR PROTECTION
- HIGH- AND LOW-PRESSURE SWITCHES

Relief Devices 113
Control Circuit, 115 V 113
Control Circuit, 24 V 113
Gas Heat 113
- LIMIT SWITCHES
- LIMIT SWITCH THERMISTOR
- ROLLOUT SWITCH

Compressor Removal 113
Compressor Replacement 113
TROUBLESHOOTING 113-122
Economizer 113
- ECONOMIZER MOTOR CHECKOUT
- CONTROL BOARD CHECKOUT

Unit Control Board Checkout 114
- BASIC CHECK
- DETAILED CHECK

Power Exhaust Variable Frequency Drive 118
Return/Exhaust Variable Frequency Drive 120
IGC Troubleshooting 122
Unit Wiring 122
TROUBLESHOOTING AND DIAGNOSTICS . . 123-133
START-UP CHECKLIST CL-1, CL-2

GENERAL

This installation instruction contains base unit installation information, including installation of thermostats and remote temperature sensors. In addition, this instruction contains start-up, control, and troubleshooting information for the constant volume (CV) units only (48ZA,ZC,ZT).

For complete information and service instructions for variable air volume (VAV) units (48ZE,ZR,ZV) and product integrated controls (PIC) units (48ZJ,ZL,ZW), refer to their respective Controls and Troubleshooting literature also enclosed in this literature packet.

NOTE: All PIC units are shipped in STANDBY mode. The accessory HSIO module must be used to change the unit to RUN mode.

The 48ZT,ZV,ZW units are equipped with standard integral economizer and high capacity power exhaust.

The 48ZC,ZL,ZR units are equipped with factory-installed return/exhaust fans.

The Staged Gas Control (SGC) option adds the capability to control the rooftop unit's gas heating system to a specified Supply Air Temperature Set Point for purposes of tempering a cool mixed-air condition.

SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment.

Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply.

Follow all safety codes, including ANSI (American National Standards Institute) Z223.1. Wear safety glasses and work gloves. Use quenching cloth for unbrazing operations. Have fire extinguisher available for all brazing operations.

⚠ WARNING

Before performing service or maintenance operations on unit, turn off main power switch to unit. Electrical shock could cause personal injury.

FOR YOUR SAFETY
WHAT TO DO IF YOU SMELL GAS

Do not try to light any appliance. Do not touch any electrical switch; do not use any phone in your building. Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you cannot reach your gas supplier, call the fire department.

FOR YOUR SAFETY

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

⚠ WARNING

Improper installation, adjustment, alteration, service, or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information, consult a qualified installer, service agency, or the gas supplier.

⚠ CAUTION

Disconnect gas piping from units when leak testing at pressures greater than 0.5 psig. Pressures greater than 0.5 psig will cause gas valve damage resulting in a hazardous condition. If gas valve is subjected to pressure greater than 0.5 psig, it must be replaced. When pressure testing field-supplied gas piping at pressures of 0.5 psig or less, the unit connected to such piping must be isolated by manually closing the gas valve.

INSTALLATION

Jobsite Survey — Complete the following checks before installation.

1. Consult local building codes and the NEC (National Electrical Code) (ANSI/NFPA [American National Standards Institute/National Fire Protection Association] 70) for special installation requirements.
2. Determine unit location (from project plans) or select unit location.
3. Check for possible overhead obstructions which may interfere with unit lifting or rigging.

⚠ CAUTION

Do not lift unit with forklift truck. Move unit with overhead rigging only.

Unit Placement — Inspect unit for transportation damage. File claim with transportation agency.

Provide clearance around and above unit for airflow, safety, and service access. Do not restrict top (area above condenser fans) in any way. Allow at least 6 ft on all sides for rated performance, code compliance, and service.

Check unit dimensional drawings for unit arrangement and minimum performance and service clearances.

Do not install unit in an indoor location. Do not locate air inlets near exhaust vents or other sources of contaminated air.

On units equipped with power exhaust option, high velocity air is exhausted out the hood. Unit should be positioned with at least 10 ft clearance between the exhaust hood and any obstruction. Although unit is weatherproof, guard against water from higher level runoff and overhangs.

Level by using unit frame as a reference. Physical data is shown in Tables 1A-6.

Roof Mount — Check building codes for weight distribution requirements. Unit weight is shown in Tables 1A-1C and 2. Unit may be mounted on class A, B, or C roofing material.

ROOF CURB — Assemble and install as described in instructions shipped with the accessory. Accessory roof curb and information required to field fabricate a roof curb is shown in Fig. 1-5. Install insulation, cant strips, roofing and counter flashing as required. For unit condensate drain to function properly, curb must be level or within tolerances shown in Fig. 1-5.

STEEL BEAMS — If roof curb is not used, support unit with steel beams along its entire length and then support steel as required. As a minimum, unit must be supported across its width at each lifting lug location.

Slab Mount — Provide a level concrete slab that extends beyond unit cabinet at least 6 inches. Make a slab 8 in. thick with 4 in. above grade. Use gravel apron in front of condenser coil air inlet to prevent grass and foliage from obstructing airflow. Ensure that slab is of sufficient height to allow for condensate trap of 4-in. on sizes 030-070 or 7-in. on sizes 075-105.

Curb Gasketing

SIZE 030-050 UNITS — After ductwork has been connected to the roof curb, attach adhesive-backed gasketing on all end rails, cross rails, and duct rails. Be sure all joints and corners of gasket are square and flush to prevent possible water leaks. Follow all applicable building codes.

SIZE 055-105 UNITS — After ductwork has been connected to the roof curb, apply gasket material ($^1/_2$-in. thick x $1^1/_2$-in. wide neoprene) where indicated.

Single-Thickness Gasketing (See Fig. 6-8 for Item Numbers) — Apply gasketing in the following places:

1. Along both side rails (1) — 2 places, full length
2. Along return air end rail (2) — 1 place
3. Around Return Air internal duct flange (3) — 1 or 2 places
4. Around Supply Air internal duct flanges (4) — 3 places

Double-Thickness Gasketing (See Fig. 6 and 8 and Detail A-A) — Locate a line $9^3/_4$-in. from the supply air end of the accessory curb. Apply a double-thickness of gasket material along with line per detail A-A.

NOTE: Do not apply gasket material along the outside edge of the curb (area "X"). This pan area of the curb extends out beneath the end of the unit's air handler section; applying gasket here develops a potential water trap area on top of the curb.

Condenser Section Roof Curb (See Fig. 7) — Apply single-thickness gasket along both side rails (5).

Field-Fabricated Ductwork

⚠ WARNING

For vertical supply and return units, tools or parts could drop into ductwork and cause an injury. Install a 90-degree turn in the supply and return ductwork between the unit and the conditioned space. If a 90-degree elbow cannot be installed, then a grille of sufficient strength and density should be installed to prevent objects from falling into the conditioned space. Failure to follow these instructions could result in personal injury or property damage due to falling objects.

The 48ZA,ZC,ZE,ZJ,ZL,ZR,ZT,ZV,ZW units are designed for vertical supply/return only. Field-fabricated ductwork must be attached to the roof curb, on to the support steel, prior to the final rigging and installation of the unit. Supply and return duct dimensions are shown in Fig. 1-3.

To attach ductwork to roof curb, insert duct approximately 10 to 11 in. up into roof curb. Connect ductwork to 14-gage roof curb material with sheet metal screws driven from inside the duct.

Secure all ducts to the building structure, using flexible duct connectors between roof curbs and ducts as required. Ducts passing through an unconditioned space must be insulated and covered with a vapor barrier. Outlet grilles must not lie directly below unit discharge. The return duct must have a 90-degree elbow before opening into the building space if the unit is equipped with power exhaust.

Design supply duct strong enough to handle expected static pressures.

Rigging — Do not drop unit; keep upright. Use spreader bars over unit to prevent sling or cable damage. Sheets of plywood placed along the condenser coils will provide additional protection. All lifting lugs MUST be used when lifting unit. Level by using unit frame as a reference. See Fig. 9-13 for information. Unit and accessory weights are shown in Tables 1A-1C and 2. Weight distribution and center of gravity can be found in Fig. 14.

Table 1A — Physical Data (48ZA,ZE,ZJ)

BASE UNIT 48ZA,ZE,ZJ	030		035	
NOMINAL CAPACITY (tons)	30		35	
OPERATING WEIGHT (lb)	Standard Chassis	Extended Chassis	Standard Chassis	Extended Chassis
Base Unit				
Low Heat	5640	6140	5766	6266
High Heat	5770	6270	5895	6395
With Economizer				
Low Heat	5941	6441	6066	6566
High Heat	6070	6570	6195	6695
COMPRESSORS	Semi-Hermetic			
Quantity...Type	2...06D		1...06D, 1...06E	
Capacity Steps (%)	17, 33, 50, 66, 83, 100		14, 28, 43, 71, 86, 100	
Number of Refrigerant Circuits	2		2	
REFRIGERANT				
Operating Charge (lb), Ckt 1/Ckt 2				
Standard Evaporator Coil	29.0/29.0		29.0/30.5	
Standard Evaporator with HGBP	31.0/29.0		31.0/30.5	
Alternate High Capacity Evaporator Coil	N/A		N/A	
Alternate High Capacity Evaporator with HGBP	N/A		N/A	
CONDENSER COILS	3/8-in. Tube Diameter			
Quantity	2		2	
Rows...Fins/in.				
Aluminum	3...15.0		3...15.0	
Copper (Optional)	3...13.7		3...13.7	
Total Face Area (sq ft)	37.5		37.5	
EVAPORATOR COILS				
Quantity	1			
Total Face Area (sq ft)	32.1			
Refrigerant Feed Device...No. per Circuit	TXV...1			
Standard Evaporator Coils	1/2 in. Tube Dia		1/2 in. Tube Dia	
Rows...Fins/in.	3...15.0		4...15.0	
Fin Type	Double Wavy		Double Wavy	
Tube Type	Cross Hatched		Cross Hatched	
Alternate, High Capacity Evaporator Coils	N/A		N/A	
Rows...Fins/in.	N/A		N/A	
Fin Type	N/A		N/A	
Tube Type	N/A		N/A	
HEATING SECTION	Low Heat	High Heat	Low Heat	High Heat
Number of Heat Exchangers	7	14	7	14
Input (MBtuh)	325	650	325	650
Output (MBtuh)	268	526	268	526
Temperature Rise Range (F)	10-40	25-55	10-40	25-55
Efficiency (%)	81	81	81	81
Burner Orifice Diameter				
Quantity (in. ...drill no.)	7 (.1285...30)	14 (.1285...30)	7 (.1258...30)	14 (.1258...30)
Manifold Pressure (in. wg)	3.3	3.3	3.3	3.3
Line Pressure (in. wg) (min...max)	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0
Firing Stages	2	2	2	2
Number of Gas Valves	1	2	1	2
CONDENSER FANS	Propeller Type			
Quantity...Diameter (in.)	2...30		2...30	
Nominal Cfm	18,600		18,600	
Motor Hp...Rpm	1.0...1140		1.0...1140	
SUPPLY FAN	Centrifugal 25 x 25 in.			
Nominal Cfm	10,500		10,500	
Maximum Allowable Cfm	15,000		15,000	
Maximum Allowable Rpm	900		900	
Shaft Diameter at Pulley (in.)	1 11/16		1 11/16	

SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit)				
Motor Hp	7.5	10	15	20	25
Motor Frame Size	213T	215T	254T	256T	284T
Efficiency at Full Load (%)					
High Efficiency	88.5	89.5	91.0	91.0	91.7
Premium Efficiency	91.7	91.7	93.0	93.6	91.7
Fan Pulley Pitch Diameter (in.)	13.7	13.7	13.7	13.7	13.7
Motor Pulley Pitch Diameter (in.)	3.4	4.3	4.9	5.5	6.5
Resulting Fan Speed (rpm)	438	549	626	703	830
Belts Quantity...Type	2...BX60	2...5VX630	2...5VX630	2...5VX630	2...5VX650
Center Distance Range (in.)	17.74-14.30	17.74-14.30	17.63...14.01	17.63...14.01	16.63...12.87

OPTIONAL POWER EXHAUST	Centrifugal, 15 x 15 in. (Any motor available on any unit)		
Quantity...Motor Hp	2...3	2...5	2...7.5
Motor Frame Size High/Premium	56HZ/184T	184T	213T
Efficiency at Full Load (%) High/Premium	81.0/88.5	87.5/89.5	88.5/91.7
Resulting Fan Rpm High/Premium	843/896	1040	1264
Maximum Allowable Rpm	1300	1300	1300
FILTERS			
Standard Efficiency Throwaway (Standard)	12...20 x 25 x 2		12...20 x 25 x 2
Quantity...Size (in.)	4...16 x 20 x 2		4...16 x 20 x 2
Medium Efficiency (30%) Pleated (Optional)	12...20 x 25 x 2		12...20 x 25 x 2
Quantity...Size (in.)	4...16 x 20 x 2		4...16 x 20 x 2
High Efficiency (90%) Bag Filters			
with High Velocity Prefilters (Optional)	12...16 x 20 x 2		12...16 x 20 x 2
Quantity...Size (in.)	3...20 x 24 x 2		3...20 x 24 x 2
OUTSIDE AIR SCREENS			
Standard Hood (25%) Quantity...Size	2...19.4 x 39.1		2...19.4 x 39.1
Optional Economizer Quantity...Size	5...20 x 20 x 1		5...20 x 20 x 1
	2...20 x 25 x 1		2...20 x 25 x 1

LEGEND

HGBP — Hot Gas Bypass
MBtuh — Btuh in Thousands
TXV — Thermostatic Expansion Valve

Table 1A — Physical Data (48ZA,ZE,ZJ) (cont)

BASE UNIT 48ZA,ZE,ZJ	040		050	
NOMINAL CAPACITY (tons)	40		50	
OPERATING WEIGHT (lb)	Standard Chassis	Extended Chassis	Standard Chassis	Extended Chassis
Base Unit				
Low Heat	6540	7040	6581	7081
High Heat	6670	7170	6710	7210
With Economizer				
Low Heat	6841	7341	6881	7381
High Heat	6970	7470	7010	7510
COMPRESSORS	Semi-Hermetic			
Quantity...Type	2...06E		1...06D, 1...06E	
Capacity Steps (%)	25, 50, 75, 100		14, 28, 43, 71, 86, 100	
Number of Refrigerant Circuits	2		2	
REFRIGERANT				
Operating Charge (lb), Ckt 1/Ckt 2				
Standard Evaporator Coil	40.0/40.0		41.5/39.0	
Standard Evaporator with HGBP	42.0/40.0		43.5/39.0	
Alternate High Capacity Evaporator Coil	50.0/51.0		49.0/49.0	
Alternate High Capacity Evaporator with HGBP	52.0/51.0		51.0/49.0	
CONDENSER COILS	3/8-in. Tube Diameter			
Quantity	2		2	
Rows...Fins/in.				
Aluminum	3...15.0		3...15.0	
Copper (Optional)	3...13.7		3...13.7	
Total Face Area (sq ft)	50.0		50.0	
EVAPORATOR COILS				
Quantity	2			
Total Face Area (sq ft)	45.5			
Refrigerant Feed Device...No. per Circuit	TXV...2			
Standard Evaporator Coils	1/2 in. Tube Dia		1/2 in. Tube Dia	
Rows...Fins/in.	3...15.0		4...15.0	
Fin Type	Double Wavy		Double Wavy	
Tube Type	Cross Hatched		Cross Hatched	
Alternate, High Capacity Evaporator Coils	1/2 in. Tube Dia		1/2 in. Tube Dia	
Rows...Fins/in.	6...16.0		6...16.0	
Fin Type	Double Wavy		Double Wavy	
Tube Type	Cross Hatched		Cross Hatched	
HEATING SECTION	Low Heat	High Heat	Low Heat	High Heat
Number of Heat Exchangers	7	14	7	14
Input (MBtuh)	325	650	325	650
Output (MBtuh)	268	526	268	526
Temperature Rise Range (F)	10-40	25-55	10-40	25-55
Efficiency (%)	81	81	81	81
Burner Orifice Diameter				
Quantity (in. ...drill no.)	7 (.1285...30)	14 (.1285...30)	7 (.1285...30)	14 (.1285...30)
Manifold Pressure (in. wg)	3.3	3.3	3.3	3.3
Line Pressure (in. wg) (min...max)	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0
Firing Stages	2	2	2	2
Number of Gas Valves	1	2	1	2
CONDENSER FANS	Propeller Type			
Quantity...Diameter (in.)	3...30		3...30	
Nominal Cfm	26,000		26,000	
Motor Hp...Rpm	1.0...1140		1.0...1140	
SUPPLY FAN	Centrifugal 25 x 25 in.			
Nominal Cfm	14,000		14,000	
Maximum Allowable Cfm	20,000		20,000	
Maximum Allowable Rpm	900		900	
Shaft Diameter at Pulley (in.)	1 11/16		1 11/16	
SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit)			
Motor Hp	7.5	10	15	20	25	30
Motor Frame Size	213T	215T	254T	256T	284T	286T
Efficiency at Full Load (%)						
High Efficiency	88.5	89.5	91.0	91.0	91.7	92.4
Premium Efficiency	91.7	91.7	93.0	93.6	91.7	92.4
Fan Pulley Pitch Diameter (in.)	13.7	13.7	13.7	13.7	13.7	12.5
Motor Pulley Pitch Diameter (in.)	3.4	4.3	4.9	5.5	6.5	6.5
Resulting Fan Speed (rpm)	438	549	626	703	830	910
Belts Quantity...Type	2...BX60	2...5VX630	2...5VX630	2...5VX630	2...5VX650	3...5VX630
Center Distance Range (in.)	17.74-14.30	17.74-14.30	17.63...14.01	17.63...14.01	16.63...12.87	16.63...12.87
OPTIONAL POWER EXHAUST	Centrifugal, 15 x 15 in. (Any motor available on any unit)					
Quantity...Motor Hp	2...3		2...5		2...7.5	
Motor Frame Size High/Premium	56HZ/184T		184T		213T	
Efficiency at Full Load (%) High/Premium	81.0/88.5		87.5/89.5		88.5/91.7	
Resulting Fan Rpm High/Premium	843/896		1040		1264	
Maximum Allowable Rpm	1300		1300		1300	
FILTERS						
Standard Efficiency Throwaway (Standard)	12...20 x 25 x 2			12...20 x 25 x 2		
Quantity...Size (in.)	4...16 x 20 x 2			4...16 x 20 x 2		
Medium Efficiency (30%) Pleated (Optional)	12...20 x 25 x 2			12...20 x 25 x 2		
Quantity...Size (in.)	4...16 x 20 x 2			4...16 x 20 x 2		
High Efficiency (90%) Bag Filters						
with High Velocity Prefilters (Optional)	12...16 x 20 x 2			12...16 x 20 x 2		
Quantity...Size (in.)	3...20 x 24 x 2			3...20 x 24 x 2		
OUTSIDE AIR SCREENS						
Standard Hood (25%) Quantity...Size	2...19.4 x 39.1			2...19.4 x 39.1		
Optional Economizer Quantity...Size	5...20 x 20 x 1			5...20 x 20 x 1		
	2...20 x 25 x 1			2...20 x 25 x 1		

LEGEND

HGBP — Hot Gas Bypass
MBtuh — Btuh in Thousands
TXV — Thermostatic Expansion Valve

Table 1A — Physical Data (48ZA,ZE,ZJ) (cont)

BASE UNIT 48ZA,ZE,ZJ	055		060		070	
NOMINAL CAPACITY (tons)	55		60		70	
OPERATING WEIGHT (lb)	Standard Chassis	Extended Chassis	Standard Chassis	Extended Chassis	Standard Chassis	
Base Unit						
Low Heat	8700	9248	9000	9,540	9,420	
High Heat	8820	9368	9120	9,668	9,550	
With Economizer						
Low Heat	9230	9730	9530	10,030	9,950	
High Heat	9350	9850	9650	10,450	10,080	
COMPRESSORS	Semi-Hermetic					
Quantity...Type	2...06E		2...06E		2...06E	
Capacity Steps (%)	25, 40, 60, 80, 100		17, 33, 50, 66, 83, 100		14, 28, 43, 71, 85, 100	
Number of Refrigerant Circuits	2		2		2	
REFRIGERANT						
Operating Charge (lb), Ckt 1/Ckt 2						
Standard Evaporator Coil	59.0/44.5		61.0/61.0		70.5/64.5	
Standard Evaporator with HGBP	62.0/44.5		64.0/61.0		73.5/64.5	
Alternate High Capacity Evaporator Coil	72.0/58.0		69.5/69.5		82.5/74.5	
Alternate High Capacity Evaporator with HGBP	75.0/58.0		72.5/69.5		85.5/74.5	
CONDENSER COILS	$^3/_8$-in. Tube Diameter					
Quantity	4		4		4	
Rows...Fins/in.						
Aluminum	2...17.0, 3...17.0		3...17.0		3...17.0	
Copper (Optional)	2...15.7, 3...15.7		3...15.7		3...15.7	
Total Face Area (sq ft)	72.4		72.4		108.4	
EVAPORATOR COILS						
Quantity	2					
Total Face Area (sq ft)	61.5					
Refrigerant Feed Device...No. per Circuit	TXV...2					
Standard Evaporator Coils	$^1/_2$ in. Tube Dia					
Rows...Fins/in.	3...17.0		4...17.0		4...17.0	
Fin Type	Double Wavy		Double Wavy		Double Wavy	
Tube Type	Smooth		Smooth		Smooth	
Alternate, High Capacity Evaporator Coils	$^1/_2$ in. Tube Dia					
Rows...Fins/in.	6...16		6...16		6...16	
Fin Type	Double Wavy		Double Wavy		Double Wavy	
Tube Type	Cross Hatched		Cross Hatched		Cross Hatched	
HEATING SECTION	Low Heat	High Heat	Low Heat	High Heat	Low Heat	High Heat
Number of Heat Exchangers	14	21	14	21	14	21
Input (MBtuh)	650	975	650	975	650	975
Output (MBtuh)	526	790	526	790	526	790
Temperature Rise Range (F)	10-40	20-50	10-40	20-50	10-40	20-50
Efficiency (%)	81	81	81	81	81	81
Burner Orifice Diameter						
Quantity (in. ...drill no.)	14 (.1285...30)	21 (.1285...30)	14 (.1285...30)	21 (.1285...30)	14 (.1285...30)	21 (.1285...30)
Manifold Pressure (in. wg)	3.3	3.3	3.3	3.3	3.3	3.3
Line Pressure (in. wg) (min...max)	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0
Firing Stages	2	2	2	2	2	2
Number of Gas Valves	2	3	2	3	2	3
CONDENSER FANS	Propeller Type					
Quantity...Diameter (in.)	4...30		4...30		5...30	
Nominal Cfm	40,000		40,000		50,000	
Motor Hp...Rpm	1.0...1140		1.0...1140		1.0...1140	
SUPPLY FAN	Centrifugal 30 x 27 in.					
Nominal Cfm	17,500		21,000		24,500	
Maximum Allowable Cfm	25,000		30,000		30,000	
Maximum Allowable Rpm	750		750		750	
Shaft Diameter at Pulley (in.)	$1^{11}/_{16}$		$1^{11}/_{16}$		$1^{11}/_{16}$	
SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit)					
Motor Hp	15		20	25	30	40
Motor Frame Size	254T		256T	284T	286T	S324T
Efficiency at Full Load (%)						
High Efficiency	91.0		91.0	91.7	92.4	93.0
Premium Efficiency	93.0		93.6	93.6	93.6	94.5
Fan Pulley Pitch Diameter (in.)	13.7		13.7	13.7	15.5	16.1
Motor Pulley Pitch Diameter (in.)	4.5		5.1	5.5	5.9	6.7
Resulting Fan Speed (rpm)	575		651	703	711	740
Belts Quantity...Type	2...5VX1230		2...5VX1230	2...5VX1230	2...5VX1230	3...5VX1250
Center Distance Range (in.)	48.25-44.00		48.25-44.00	48.50-44.25	48.50-44.25	48.25-44.00
OPTIONAL POWER EXHAUST	Centrifugal, 15 x 15 in. (Any motor available on any unit)					
Quantity...Motor Hp	2...5		2...7.5		2...10	
Motor Frame Size High/Premium	184T		213T		215T	
Efficiency at Full Load (%) High/Premium	87.5/89.5		88.5/91.7		89.5/91.7	
Resulting Fan Rpm High/Premium	740		820		920	
Maximum Allowable Rpm	925		925		925	
FILTERS						
Standard Efficiency Throwaway (Standard)	15...20 x 25 x 2		15...20 x 25 x 2		15...20 x 25 x 2	
Quantity...Size (in.)	5...16 x 20 x 2		5...16 x 20 x 2		5...16 x 20 x 2	
Medium Efficiency (30%) Pleated (Optional)	15...20 x 25 x 2		15...20 x 25 x 2		15...20 x 25 x 2	
Quantity...Size (in.)	5...16 x 20 x 2		5...16 x 20 x 2		5...16 x 20 x 2	
High Efficiency (90%) Bag Filters with High Velocity Prefilters (Optional)	6...20 x 24 x 2		6...20 x 24 x 2		6...20 x 24 x 2	
Quantity...Size (in.)	6...24 x 24 x 2		6...24 x 24 x 2		6...24 x 24 x 2	
OUTSIDE AIR SCREENS						
Standard Hood (25%) Quantity...Size	2...15.5 x 69.6		2...15.5 x 69.6		2...15.5 x 69.6	
Optional Economizer Quantity...Size	12...16 x 25 x 1 2...16 x 20 x 1		12...16 x 25 x 1 2...16 x 20 x 1		12...16 x 25 x 1 2...16 x 20 x 1	

LEGEND

HGBP — Hot Gas Bypass
MBtuh — Btuh in Thousands
TXV — Thermostatic Expansion Valve

Table 1A — Physical Data (48ZA,ZE,ZJ) (cont)

UNIT 48ZA,ZE,ZJ	075		090		105	
NOMINAL CAPACITY (tons)	75		90		105	
OPERATING WEIGHT (lb)						
Base Unit without Economizer						
Low Heat/High Heat	10,270/10,445		10,480/10,655		11,210/11,385	
With Economizer						
Low Heat/High Heat	10,800/10,975		11,010/11,185		11,740/11,915	
COMPRESSOR	Semi-Hermetic					
Number	2		2		4	
Circuit (No. Cyl)	A (6)	B (6)	A (6)	B (6)	A1 (6), A2 (4)	B1 (6), B2 (4)
Model 06E	-275	-299	-299	-299	-275, -250	-275, -250
Oil Charge (pints)	19	19	19	19	19, 14	19, 14
Capacity Steps (%)						
ZA	43, 100		50, 100		50, 100	
ZE	14,29,43,71,86,100		17,33,50,67,83,100		20,30,50,60,70,80,90,100	
ZJ	19,38,57,71,86,100		17,33,50,67,83,100		20,30,40,50,60,70,80,90,100	
Number of Refrigerant Circuits	2		2		2	
REFRIGERANT						
Operating Charge (lb), Ckt 1/Ckt 2						
Standard Evaporator Coil	70.5/64.5		64.0/64.0		68.0/68.0	
Standard Evaporator with HGBP	73.5/64.5		67.0/64.0		71.0/68.0	
Alternate High Capacity Evaporator Coil	83.0/75.0		76.0/76.0		79.5/79.5	
Alternate High Capacity Evaporator with HGBP	86.0/75.0		79.0/76.0		82.5/79.5	
CONDENSER COILS	$^3/_8$″ Tube Diameter					
Quantity	4		4		4	
Rows...Fins/in.						
Aluminum	3...17.0		3...17.0		3...17.0	
Copper (Optional)	3...15.7		3...15.7		3...15.7	
Fin Type	Double Wavy		Lanced, Sine-wave		Lanced, Sine-wave	
Tube Type	Smooth		Cross-Hatched		Cross-Hatched	
Total Face Area (sq ft)	108.4		108.4		108.4	
EVAPORATOR COILS						
Quantity	2					
Total Face Area (sq ft)	61.5					
Refrigerant Feed Device...No. per Circuit	TXV...2					
Standard Evaporator Coils	$^1/_2$ in. Tube Dia		$^3/_8$ in. Tube Dia		$^3/_8$ in. Tube Dia	
Rows...Fins/in.	4...17.0		4...17.0		4...17.0	
Fin Type	Double Wavy		Lanced, Sine Wave		Lanced, Sine Wave	
Tube Type	Smooth		Cross Hatched		Cross Hatched	
Alternate, High Capacity Evaporator Coils	$^1/_2$ in. Tube Dia					
Rows...Fins/in.	6...16		6...16		6...16	
Fin Type	Double Wavy		Double Wavy		Double Wavy	
Tube Type	Cross Hatched		Cross Hatched		Cross Hatched	
HEATING SECTION	Low Heat	High Heat	Low Heat	High Heat	Low Heat	High Heat
Number of Heat Exchangers	2	3	2	3	2	3
Input (MBtuh)	650	975	650	975	650	975
Output (MBtuh)	527	790	527	790	527	790
Temperature Rise Range (F)	10-40	20-50	10-40	20-50	10-40	20-50
Efficiency (%)	81	81	81	81	81	81
Burner Orifice Diameter						
Quantity (in. ...drill no.)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)
Manifold Pressure (in. wg)	3.3	3.3	3.3	3.3	3.3	3.3
Line Pressure (in. wg) (Min...Max)	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0
Number of Gas Valves	2	3	2	3	2	3
CONDENSER FAN	Propeller Type					
Quantity...Diameter (in.)	5...30		6...30		6...30	
Nominal Cfm	50,000		60,000		60,000	
Motor Hp (ea)...rpm	1.0...1140		1.0...1140		1.0...1140	
STANDARD SUPPLY FAN	Forward Curved Centrifugal 36 x 30 in.					
Nominal Cfm	24,500		29,750		35,000	
Maximum Allowable Cfm	30,000		34,000		40,000	
Maximum Allowable Rpm	670		670		670	
Shaft Diameter at Pulley (in.)	$1^{11}/_{16}$		$1^{11}/_{16}$		$1^{11}/_{16}$	
STANDARD SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit.)					
Motor Hp	30	40	50	60		
Motor Frame Size	S268T	S324T	S36T	S364T		
Efficiency at Full Load (%)						
High Efficiency	92.4	93.0	93.0	93.6		
Premium Efficiency	93.6	94.5	94.5	95.4		
Fan Pulley Pitch Diameter (in.)	18.5	18.5	18.5	18.5		
Motor Pulley Pitch Diameter (in.)	5.3	5.7	6.5	7.1		
Resulting Fan Rpm	501	539	615	672		
Belts Quantity...Type	3...5VX1320	4...5VX1320	4...5VX1320	4...5VX1320		
Center Distance Range (in.)	47.88-45.01	47.64-44.76	47.42-44.52	47.42-44.52		
ALTERNATE, AIRFOIL FAN	Airfoil					
Nominal Airflow (cfm)	24,500		29,750		35,000	
Maximum Allowable Airflow (cfm)	30,000		34,000		40,000	
Maximum Allowable Wheel Speed (rpm)	1846		1846		1846	
Shaft Diameter at Pulley (in.)	$2^{11}/_{16}$		$2^{11}/_{16}$		$2^{11}/_{16}$	
ALTERNATE SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit.)					
Motor Hp	30	40	50	60	75	
Motor Frame Size	S268T	S324T	S36T	S364T	365T	
Efficiency at Full Load (%)						
High Efficiency	92.4	93.0	93.0	93.6	94.1	
Premium Efficiency	93.6	94.5	94.5	95.4	95.4	
Fan Pulley Pitch Diameter (in.)	9.7	10.1	8.9	8.9	10.8	
Motor Pulley Pitch Diameter (in.)	7.5	8.7	8.1	8.7	11.1	
Resulting Fan Rpm	1353	1493	1593	1711	1799	
Belts Quantity...Type	2...5VX1150	2...5VX1180	3...5VX1150	3...5VX1150	3...5VX1230	
Center Distance Range (in.)	42.96...45.82	42.69...45.57	42.69...45.57	42.45...45.35	42.45...45.35	

Table 1A — Physical Data (48ZA,ZE,ZJ) (cont)

UNIT 48ZA,ZE,ZJ	075	090	105
OPTIONAL POWER EXHAUST	Centrifugal, 18 x 15 in. (Any motor available on any unit.)		
Quantity...Motor Hp	2...5.0	2...7.5	2...10.0
Motor Frame Size	184T	213T	215T
Efficiency at Full Load (%)			
High Efficiency	87.5	88.5	89.5
Premium Efficiency	89.5	91.7	91.7
Fan Pulley Pitch Diameter (in.)	10.6	10.6	10.6
Motor Pulley Pitch Diameter (in.)	4.5	5.0	5.6
Shaft Diameter at Pulley (in.)	$1^{7}/_{16}$	$1^{7}/_{16}$	$1^{7}/_{16}$
Resulting Fan Rpm	740	820	920
Maximum Allowable Rpm	925	925	925
FILTERS			
Medium Efficiency (30%) Pleated	15...20 x 25 x 2	18...20 x 25 x 2	18...20 x 25 x 2
(Standard) Qty...Size (in.)	5...16 x 20 x 2	6...16 x 20 x 2	6...16 x 20 x 2
High Efficiency (65%) Pleated	15...20 x 25 x 2	18...20 x 25 x 2	18...20 x 25 x 2
(Optional) Qty...Size (in.)	5...16 x 20 x 2	6...16 x 20 x 2	6...16 x 20 x 2
OUTSIDE AIR SCREENS			
Standard (25% Hoods) (Qty) Size (in.)	(4) 25 x 16 x 1 (2) 20 x 16 x 1	(4) 25 x 16 x 1 (2) 20 x 16 x 1	(4) 25 x 16 x 1 (2) 20 x 16 x 1
Optional Economizer (Qty) Size (in.)	(12) 25 x 16 x 1 (2) 20 x 16 x 1	(12) 25 x 16 x 1 (2) 20 x 16 x 1	(12) 25 x 16 x 1 (2) 20 x 16 x 1

LEGEND

HGBP — Hot Gas Bypass
MBtuh — Btuh in Thousands
TXV — Thermostatic Expansion Valve

Table 1B — Physical Data (48ZC,ZL,ZR)

UNIT 48ZC,ZL,ZR	075		090		105	
NOMINAL CAPACITY (tons)	75		90		105	
OPERATING WEIGHT (lb)						
Base Unit without Economizer						
Low Heat/High Heat	11,740/11,915		11,950/12,125		12,680/12,855	
With Economizer						
Low Heat/High Heat	12,270/12,445		12,480/12,655		13,210/13,385	
COMPRESSOR	Semi-Hermetic					
Number	2		2		4	
Circuit (No. Cyl)	A (6)	B (6)	A (6)	B (6)	A1 (6), A2 (4)	B1 (6), B2 (4)
Model 06E	-275	-299	-299	-299	-275, -250	-275, -250
Oil Charge (pints)	19	19	19	19	19, 14	19, 14
Capacity Steps (%)						
ZC	43, 100		50, 100		50, 100	
ZR	14,29,43,71,86,100		17,33,50,67,83,100		20,30,50,60,70,80,90,100	
ZL	19,38,57,71,86,100		17,33,50,67,83,100		20,30,40,50,60,70,80,90,100	
Number of Refrigerant Circuits	2		2		2	
REFRIGERANT						
Operating Charge (lb), Ckt 1/Ckt 2						
Standard Evaporator Coil	70.5/64.5		64.0/64.0		68.0/68.0	
Standard Evaporator with HGBP	73.5/64.5		67.0/64.0		71.0/68.0	
Alternate High Capacity Evaporator Coil	83.0/75.0		76.0/76.0		79.5/79.5	
Alternate High Capacity Evaporator with HGBP	86.0/75.0		79.0/76.0		82.5/79.5	
CONDENSER COILS	3/8″ Tube Diameter					
Quantity	4		4		4	
Rows...Fins/in.						
Aluminum	3...17.0		3...17.0		3...17.0	
Copper (Optional)	3...15.7		3...15.7		3...15.7	
Fin Type	Double Wavy		Lanced, Sine-wave		Lanced, Sine-wave	
Tube Type	Smooth		Cross-Hatched		Cross-Hatched	
Total Face Area (sq ft)	108.4		108.4		108.4	
EVAPORATOR COILS						
Quantity	2					
Total Face Area (sq ft)	61.5					
Refrigerant Feed Device...No. per Circuit	TXV...2					
Standard Evaporator Coils	1/2 in. Tube Dia		3/8 in. Tube Dia		3/8 in. Tube Dia	
Rows...Fins/in.	4...17.0		4...17.0		4...17.0	
Fin Type	Double Wavy		Lanced, Sine Wave		Lanced, Sine Wave	
Tube Type	Smooth		Cross Hatched		Cross Hatched	
Alternate, High Capacity Evaporator Coils	1/2 in. Tube Dia					
Rows...Fins/in.	6...16		6...16		6...16	
Fin Type	Double Wavy		Double Wavy		Double Wavy	
Tube Type	Cross Hatched		Cross Hatched		Cross Hatched	
HEATING SECTION	Low Heat	High Heat	Low Heat	High Heat	Low Heat	High Heat
Number of Heat Exchangers	2	3	2	3	2	3
Input (MBtuh)	650	975	650	975	650	975
Output (MBtuh)	527	790	527	790	527	790
Temperature Rise Range (F)	10-40	20-50	10-40	20-50	10-40	20-50
Efficiency (%)	81	81	81	81	81	81
Burner Orifice Diameter						
Quantity (in. ...drill no.)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)
Manifold Pressure (in. wg)	3.3	3.3	3.3	3.3	3.3	3.3
Line Pressure (in. wg) (Min...Max)	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0
Number of Gas Valves	2	3	2	3	2	3
CONDENSER FAN	Propeller Type					
Quantity...Diameter (in.)	5...30		6...30		6...30	
Nominal Cfm	50,000		60,000		60,000	
Motor Hp (ea)...rpm	1.0...1140		1.0...1140		1.0...1140	
STANDARD SUPPLY FAN	Forward Curved Centrifugal 36 x 30 in.					
Nominal Cfm	24,500		29,750		35,000	
Maximum Allowable Cfm	30,000		34,000		40,000	
Maximum Allowable Rpm	670		670		670	
Shaft Diameter at Pulley (in.)	1 11/16		1 11/16		1 11/16	
STANDARD SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit.)					
Motor Hp	30	40	50	60		
Motor Frame Size	S268T	S324T	S36T	S364T		
Efficiency at Full Load (%)						
High Efficiency	92.4	93.0	93.0	93.6		
Premium Efficiency	93.6	94.5	94.5	95.4		
Fan Pulley Pitch Diameter (in.)	18.5	18.5	18.5	18.5		
Motor Pulley Pitch Diameter (in.)	5.3	5.7	6.5	7.1		
Resulting Fan Rpm	501	539	615	672		
Belts Quantity...Type	3...5VX1320	4...5VX1320	4...5VX1320	4...5VX1320		
Center Distance Range (in.)	47.88-45.01	47.64-44.76	47.42-44.52	47.42-44.52		
ALTERNATE, AIRFOIL FAN	Airfoil					
Nominal Airflow (cfm)	24,500		29,750		35,000	
Maximum Allowable Airflow (cfm)	30,000		34,000		40,000	
Maximum Allowable Wheel Speed (rpm)	1846		1846		1846	
Shaft Diameter at Pulley (in.)	2 11/16		2 11/16		2 11/16	
ALTERNATE SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit.)					
Motor Hp	30	40	50	60	75	
Motor Frame Size	S268T	S324T	S36T	S364T	365T	
Efficiency at Full Load (%)						
High Efficiency	92.4	93.0	93.0	93.6	94.1	
Premium Efficiency	93.6	94.5	94.5	95.4	95.4	
Fan Pulley Pitch Diameter (in.)	9.7	10.1	8.9	8.9	10.8	
Motor Pulley Pitch Diameter (in.)	7.5	8.7	8.1	8.7	11.1	
Resulting Fan Rpm	1353	1493	1593	1711	1799	
Belts Quantity...Type	2...5VX1150	2...5VX1180	3...5VX1150	3...5VX1150	3...5VX1230	
Center Distance Range (in.)	42.96...45.82	42.69...45.57	42.69...45.57	42.45...45.35	42.45...45.35	

Table 1B — Physical Data (48ZC,ZL,ZR) (cont)

UNIT 48ZC,ZL,ZR	075		090	105
RETURN/EXHAUST FAN	Plenum Fan, 47.13 in. (Any motor available on any unit.)			
Quantity...Motor Hp	1...20	1...25	1...30	1...40
Motor Frame Size	256T	284T	286T	324T
Efficiency at Full Load (%) High/Premium	91/93.6	91.7/93.6	92.4/93.6	93/93.8
Fan Pulley Pitch Diameter (in.)	8.5	9.8	8.5	8.5
Motor Pulley Pitch Diameter (in.)	5.3	6.7	6.1	6.7
Shaft Diameter at Pulley (in.)	$2^{15}/_{16}$	$2^{15}/_{16}$	$2^{15}/_{16}$	$2^{15}/_{16}$
Resulting Fan Rpm	1104	1209	1271	1396
Maximum Allowable Rpm	1447	1447	1447	1447
FILTERS				
Medium Efficiency (30%) Pleated (Standard) Qty...Size (in.)	15...20 x 25 x 2 5...16 x 20 x 2		18...20 x 25 x 2 6...16 x 20 x 2	18...20 x 25 x 2 6...16 x 20 x 2
High Efficiency (65%) Pleated (Optional) Qty...Size (in.)	15...20 x 25 x 2 5...16 x 20 x 2		18...20 x 25 x 2 6...16 x 20 x 2	18...20 x 25 x 2 6...16 x 20 x 2
OUTSIDE AIR SCREENS				
Standard (25% Hoods) (Qty) Size (in.)	(4) 25 x 16 x 1 (2) 20 x 16 x 1		(4) 25 x 16 x 1 (2) 20 x 16 x 1	(4) 25 x 16 x 1 (2) 20 x 16 x 1
Optional Economizer (Qty) Size (in.)	(12) 25 x 16 x 1 (2) 20 x 16 x 1		(12) 25 x 16 x 1 (2) 20 x 16 x 1	(12) 25 x 16 x 1 (2) 20 x 16 x 1

LEGEND

HGBP — Hot Gas Bypass
MBtuh — Btuh in Thousands
TXV — Thermostatic Expansion Valve

Table 1C — Physical Data (48ZT,ZV,ZW)

UNIT 48ZT,ZV,ZW	075		090		105	
NOMINAL CAPACITY (tons)	75		80		100	
OPERATING WEIGHT (lb)						
Base Unit without Economizer						
Low Heat/High Heat	13,205/13,380		13,415/13,590		14,145/14,320	
COMPRESSOR	Semi-Hermetic					
Number	2		2		4	
Circuit (No. Cyl)	A (6)	B (6)	A (6)	B (6)	A1 (6), A2 (4)	B1 (6), B2 (4)
Model 06E	-275	-299	-299	-299	-275, -250	-275, -250
Oil Charge (pints)	19	19	19	19	19, 14	19, 14
Capacity Steps (%)						
ZT	43, 100		50, 100		50, 100	
ZV	14,29,43,71,86,100		17,33,50,67,83,100		20,30,50,60,70,80,90,100	
ZW	19,38,57,71,86,100		17,33,50,67,83,100		20,30,40,50,60,70,80,90,100	
Number of Refrigerant Circuits	2		2		2	
REFRIGERANT						
Operating Charge (lb), Ckt 1/Ckt 2						
Standard Evaporator Coil	70.5/64.5		64.0/64.0		68.0/68.0	
Standard Evaporator with HGBP	73.5/64.5		67.0/64.0		71.0/68.0	
Alternate High Capacity Evaporator Coil	83.0/75.0		76.0/76.0		79.5/79.5	
Alternate High Capacity Evaporator with HGBP	86.0/75.0		79.0/76.0		82.5/79.5	
CONDENSER COILS			3/8″ Tube Diameter			
Quantity	4		4		4	
Rows...Fins/in.						
Aluminum	3...17.0		3...17.0		3...17.0	
Copper (Optional)	3...15.7		3...15.7		3...15.7	
Fin Type	Double Wavy		Lanced, Sine-wave		Lanced, Sine-wave	
Tube Type	Smooth		Cross-Hatched		Cross-Hatched	
Total Face Area (sq ft)	108.4		108.4		108.4	
EVAPORATOR COILS						
Quantity			2			
Total Face Area (sq ft)			61.5			
Refrigerant Feed Device...No. per Circuit			TXV...2			
Standard Evaporator Coils	1/2 in. Tube Dia		3/8 in. Tube Dia		3/8 in. Tube Dia	
Rows...Fins/in.	4...17.0		4...17.0		4...17.0	
Fin Type	Double Wavy		Lanced, Sine Wave		Lanced, Sine Wave	
Tube Type	Smooth		Cross Hatched		Cross Hatched	
Alternate, High Capacity Evaporator Coils			1/2 in. Tube Dia			
Rows...Fins/in.	6...16		6...16		6...16	
Fin Type	Double Wavy		Double Wavy		Double Wavy	
Tube Type	Cross Hatched		Cross Hatched		Cross Hatched	
HEATING SECTION	Low Heat	High Heat	Low Heat	High Heat	Low Heat	High Heat
Number of Heat Exchangers	2	3	2	3	2	3
Input (MBtuh)	650	975	650	975	650	975
Output (MBtuh)	527	790	527	790	527	790
Temperature Rise Range (F)	10-40	20-50	10-40	20-50	10-40	20-50
Efficiency (%)	81	81	81	81	81	81
Burner Orifice Diameter						
Quantity (in. ...drill no.)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)
Manifold Pressure (in. wg)	3.3	3.3	3.3	3.3	3.3	3.3
Line Pressure (in. wg) (Min...Max)	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0
Number of Gas Valves	2	3	2	3	2	3
CONDENSER FAN			Propeller Type			
Quantity...Diameter (in.)	5...30		6...30		6...30	
Nominal Cfm	50,000		60,000		60,000	
Motor Hp (ea)...rpm	1.0...1140		1.0...1140		1.0...1140	
STANDARD SUPPLY FAN	Forward Curved Centrifugal 36 x 30 in.					
Nominal Cfm	24,500		29,750		35,000	
Maximum Allowable Cfm	30,000		34,000		40,000	
Maximum Allowable Rpm	670		670		670	
Shaft Diameter at Pulley (in.)	1 11/16		1 11/16		1 11/16	
STANDARD SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit.)					
Motor Hp	30		40	50	60	
Motor Frame Size	S268T		S324T	S36T	S364T	
Efficiency at Full Load (%)						
High Efficiency	92.4		93.0	93.0	93.6	
Premium Efficiency	93.6		94.5	94.5	95.4	
Fan Pulley Pitch Diameter (in.)	18.5		18.5	18.5	18.5	
Motor Pulley Pitch Diameter (in.)	5.3		5.7	6.5	7.1	
Resulting Fan Rpm	501		539	615	672	
Belts Quantity...Type	3...5VX1320		4...5VX1320	4...5VX1320	4...5VX1320	
Center Distance Range (in.)	47.88-45.01		47.64-44.76	47.42-44.52	47.42-44.52	
ALTERNATE, AIRFOIL FAN	Airfoil					
Nominal Airflow (cfm)	24,500		29,750		35,000	
Maximum Allowable Airflow (cfm)	30,000		34,000		40,000	
Maximum Allowable Wheel Speed (rpm)	1846		1846		1846	
Shaft Diameter at Pulley (in.)	2 11/16		2 11/16		2 11/16	
ALTERNATE SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit.)					
Motor Hp	30	40	50	60	75	
Motor Frame Size	S268T	S324T	S36T	S364T	365T	
Efficiency at Full Load (%)						
High Efficiency	92.4	93.0	93.0	93.6	94.1	
Premium Efficiency	93.6	94.5	94.5	95.4	95.4	
Fan Pulley Pitch Diameter (in.)	9.7	10.1	8.9	8.9	10.8	
Motor Pulley Pitch Diameter (in.)	7.5	8.7	8.1	8.7	11.1	
Resulting Fan Rpm	1353	1493	1593	1711	1799	
Belts Quantity...Type	2...5VX1150	2...5VX1180	3...5VX1150	3...5VX1150	3...5VX1230	
Center Distance Range (in.)	42.96...45.82	42.69...45.57	42.69...45.57	42.45...45.35	42.45...45.35	

Table 1C — Physical Data — (48ZT,ZV,ZW) (cont)

UNIT 48ZT,ZV,ZW	075		090		105
POWER EXHAUST	Centrifugal, 22 x 20 in., $1^{11}/_{16}$ in. shaft diameter (Any motor available on any unit)				
Total Hp	20	30	40	50	60
Quantity...Motor Hp	2...10	2...15	2...20	2...25	2...30
Motor Frame Size	S215T	D254T	S256T	S284T	S286T
Efficiency at Full Load (%)					
High Efficiency	89.5	91	91	91.7	92.4
Premium Efficiency	91.7	93	93.6	93.6	93.6
Fan Sheave Pitch Diameter (in.)	12.4	12.4	11.1	11.1	11.1
Motor Sheave Pitch Diameter (in.)	4.8	5.8	5.9	6.5	6.9
Resulting Fan Rpm	714	841	928	1020	1094
Maximum Allowable Rpm	1175	1175	1175	1175	1175
Belts — Quantity...Type	2...BX	2...BX	2...5VX	2...5VX	2...5VX
FILTERS					
Medium Efficiency (30%) Pleated (Standard) Qty...Size (in.)	15...20 x 25 x 2 5...16 x 20 x 2		18...20 x 25 x 2 6...16 x 20 x 2		18...20 x 25 x 2 6...16 x 20 x 2
High Efficiency (65%) Pleated (Optional) Qty...Size (in.)	15...20 x 25 x 2 5...16 x 20 x 2		18...20 x 25 x 2 6...16 x 20 x 2		18...20 x 25 x 2 6...16 x 20 x 2
OUTSIDE AIR SCREENS					
Quantity...Size (in.)	8...16 x 20 x 1 2...16 x 25 x 1 4...20 x 20 x 1 4...20 x 25 x 1				

LEGEND

HGBP — Hot Gas Bypass
MBtuh — Btuh in Thousands
TXV — Thermostatic Expansion Valve

Table 2 — Operating Weights of Options and Accessories

OPTION OR ACCESSORY	UNIT SIZE							
	030,035	040,050	055	060	070	075	090	105
Roof Curb	450	480	515	515	515	560	560	560
Condenser Section Roof Curb	—	—	540	540	625	625	625	625
Economizer*	300	300	530	530	530	530	530	530
Power Exhaust*	600	600	710	710	710	710	710	710
Barometric Relief	200	200	200	200	200	200	200	200
Return Exhaust Fan*	—	—	—	—	—	1470	1470	1470
High-Efficiency Filters	20	20	20	20	20	—	—	—
Bag Filters	35	35	40	40	40	—	—	—
Hail Guard	120	150	145	145	210	210	210	210
Copper Condenser Coil Fins	180	235	235	235	420	420	420	420
Inlet Guide Vanes	95	95	115	115	115	115	115	115
Variable Frequency Drive								
7.5 hp	65	65	—	—	—	—	—	—
10 hp	65	65	—	—	—	—	—	—
15 hp	110	110	110	110	110	—	—	—
20 hp	111	111	111	111	111	111	111	111
25 hp	190	190	190	190	190	190	190	190
30 hp	190	190	190	190	190	152	152	152
40 hp	—	190	190	190	190	155	155	155
50 hp	—	—	—	—	—	263	263	263
60 hp	—	—	—	—	—	266	266	266
High Capacity Evaporator Coil	300	300	300	300	300	300	300	300

*Includes hood.

Table 3 — Supply Fan Drive Data

HP	SHAFT DIA	SPEED (rpm)	MOTOR SHEAVE	MOTOR PITCH DIA.	WHEEL SHEAVE	WHEEL PITCH DIA.	QUANTITY ...BELT
Sizes 030-050							
7.5	1 3/8	438	2BK36	3.4	2B5V136	13.6	2...BX60
10	1 3/8	549	2B5V42	4.3	2B5V136	13.7	2...5VX630
15	1 5/8	626	2B5V48	4.9	2B5V136	13.7	2...5VX630
20	1 5/8	703	2B5V54	5.5	2B5V136	13.7	2...5VX630
25	1 7/8	830	2B5V64	6.5	2B5V136	13.7	2...5VX650
30*	1 7/8	910	3B5V64	6.5	3B5V124	12.5	3...5VX630
Sizes 055-070							
15	1 5/8	575	2B5V44	4.5	2B5V136	13.7	2...5VX1230
20	1 5/8	651	2B5V50	5.1	2B5V136	13.7	2...5VX1230
25	1 7/8	703	2B5V54	5.5	2B5V136	13.7	2...5VX1230
30	1 7/8	711	2B5V62	6.3	2B5V154	15.5	2...5VX1250
40	2 1/8	740	3B5V66	6.7	3B5V160	16.1	3...5VX1250
Sizes 075-105 (Forward Curved Fan)							
30	1 7/8	501	3B5V52	5.33	B5V184	18.5	3...5VX1320
40	2 1/8	539	4B5V56	5.74	B5V184	18.5	4...5VX1320
50	2 1/8	615	4B5V64	6.54	B5V184	18.5	4...5VX1320
60	2 3/8	672	4B5V70	7.14	B5V184	18.5	4...5VX1320
Sizes 075-105 (Airfoil Fan)							
30	1 7/8	1353	2B5V74	7.5	2Q5V97	9.7	2...5VX1150
40	2 1/8	1493	2B5V86	8.7	2Q5V103	10.2	2...5VX1180
50	2 1/8	1593	3B5V80	8.1	3R5V90	8.9	3...5VX1150
60	2 3/8	1711	3B5V86	8.7	3R5V90	8.9	3...5VX1150
75	2 3/8	1799	3B5V110	11.1	3R5V109	10.8	3...5VX1230

*Sizes 040,050 only.

NOTE: Part numbers are Browning Manufacturing Corp. reference.

Table 4 — Power Exhaust Fan Drive Data

TOTAL HP	MOTOR QTY...HP	MOTOR SHAFT DIA	FAN SPEED RPM	MOTOR SHEAVE P/N	PITCH DIA	FAN SHEAVE P/N	PITCH DIA	BELTS QTY...P/N	CENTER DIST
Sizes 030-050									
6*	2...3	7/8	843	2H3V33	3.30	2Q3V69	6.85	2...3VX670	23.7-26.3
6†	2...3	1 1/8	896	2P3V41	4.07	2Q3V80	7.95	2...3VX670	23.7-26.3
10**	2...5	1 3/8	1040	2P3V41	4.07	2Q3V69	6.85	2...3VX670	23.7-26.3
15**	2...7.5	1 3/8	1264	2P3V50	4.95	2Q3V69	6.85	2...3VX710	23.7-26.3
Sizes 055-105									
10	2...5	1 1/8	740	2P3V45	4.5	2Q3V106	10.6	2...3VX800	26.8-28.5
15	2...7.5	1 3/8	820	2P3V50	5.0	2Q3V106	10.6	2...3VX800	26.8-28.5
20	2...10	1 3/8	920	2P3V56	5.6	2Q3V106	10.6	2...3VX800	26.8-28.5

*High Efficiency Motor Option.
†Premium Efficiency Motor Option.
**Applies to both motor options.

NOTE: Part numbers are Browning Manufacturing Corp. reference.

Table 5 — High-Capacity Power Exhaust Fan Drive Data (48ZT,ZV,ZW Units)

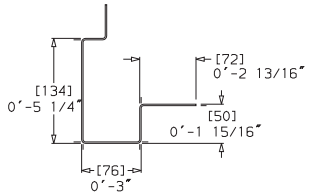
TOTAL HP	MOTOR QTY...HP	MOTOR SHAFT DIA. (in.)	SPEED RPM	MOTOR SHEAVE		BLOWER SHEAVE		QTY...BELT	CENTER DISTANCE RANGE (in.)
				Part Number	Pitch Diameter (in.)	Part Number	Pitch Diameter (in.)		
20	2...10	1.375	714	2B5V48	4.8	2B5V124	12.4	2...BX93	32.8 to 36.7
30	2...15	1.625	841	2B5V58	5.8	2B5V124	12.4	2...BX93	32.6 to 36.5
40	2...20	1.625	928	2B5V58	5.9	2B5V110	11.1	2...5VX950	32.6 to 36.5
50	2...25	1.875	1020	2B5V64	6.5	2B5V110	11.1	2...5VX950	32.5 to 36.3
60	2...30	1.875	1094	2B5V68	6.9	2B5V110	11.1	2...5VX950	32.5 to 36.3

Table 6 — Return/Exhaust Fan Drive Data (50ZC,ZL,ZR Units)

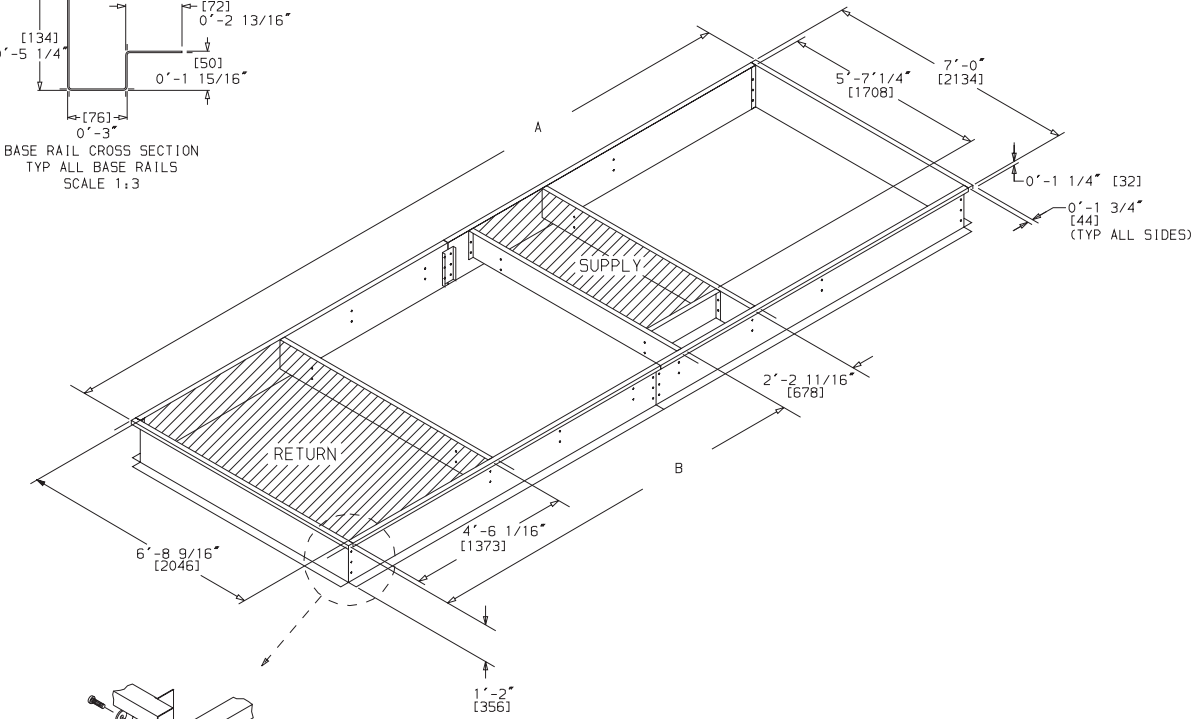
TOTAL HP	MOTOR QTY...HP	MOTOR SHAFT DIA. (in.)	SPEED RPM	MOTOR SHEAVE		BLOWER SHEAVE		QTY...BELT	CENTER DISTANCE RANGE (in.)
				Part Number	Pitch Diameter (in.)	Part Number	Pitch Diameter (in.)		
20	1...20	1.625	1104	3B5V52	5.3	3R5V85	8.5	3...5VX1000	38.1 to 41.0
25	1...25	1.875	1209	3B5V66	6.7	3R5V97	9.8	3...5VX1060	38.9 to 41.8
30	1...30	1.875	1271	3B5V60	6.1	3R5V85	8.5	3...5VX1030	38.9 to 41.8
40	1...40	2.125	1396	3B5V66	6.7	3R5V85	8.5	3...5VX1060	39.9 to 42.8

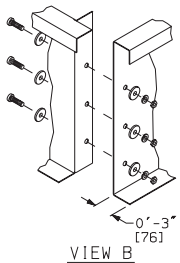
NOTES:

1. ROOF CURB IS SHIPPED DISASSEMBLED.
2. ROOFCURB: 14 GA.[VA03-56] STL.
3. DIMENSIONS IN [ ] ARE MILLIMETERS.

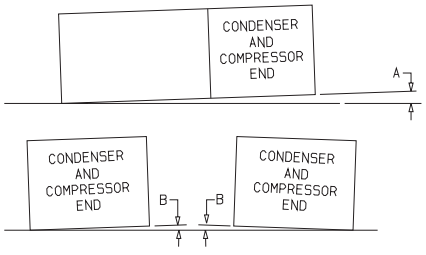


BASE RAIL CROSS SECTION
TYP ALL BASE RAILS
SCALE 1:3





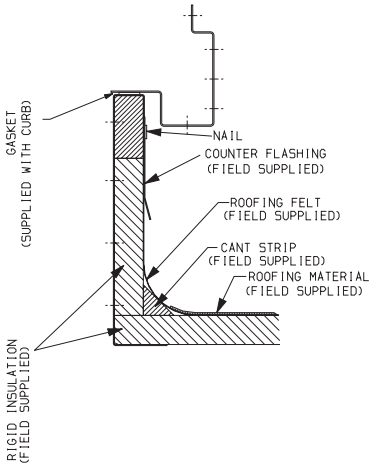
VIEW B
(CORNER CONNECTIONS AND SPLICE PLATE CONNECTIONS)



DIMENSIONS
(degrees and inches)

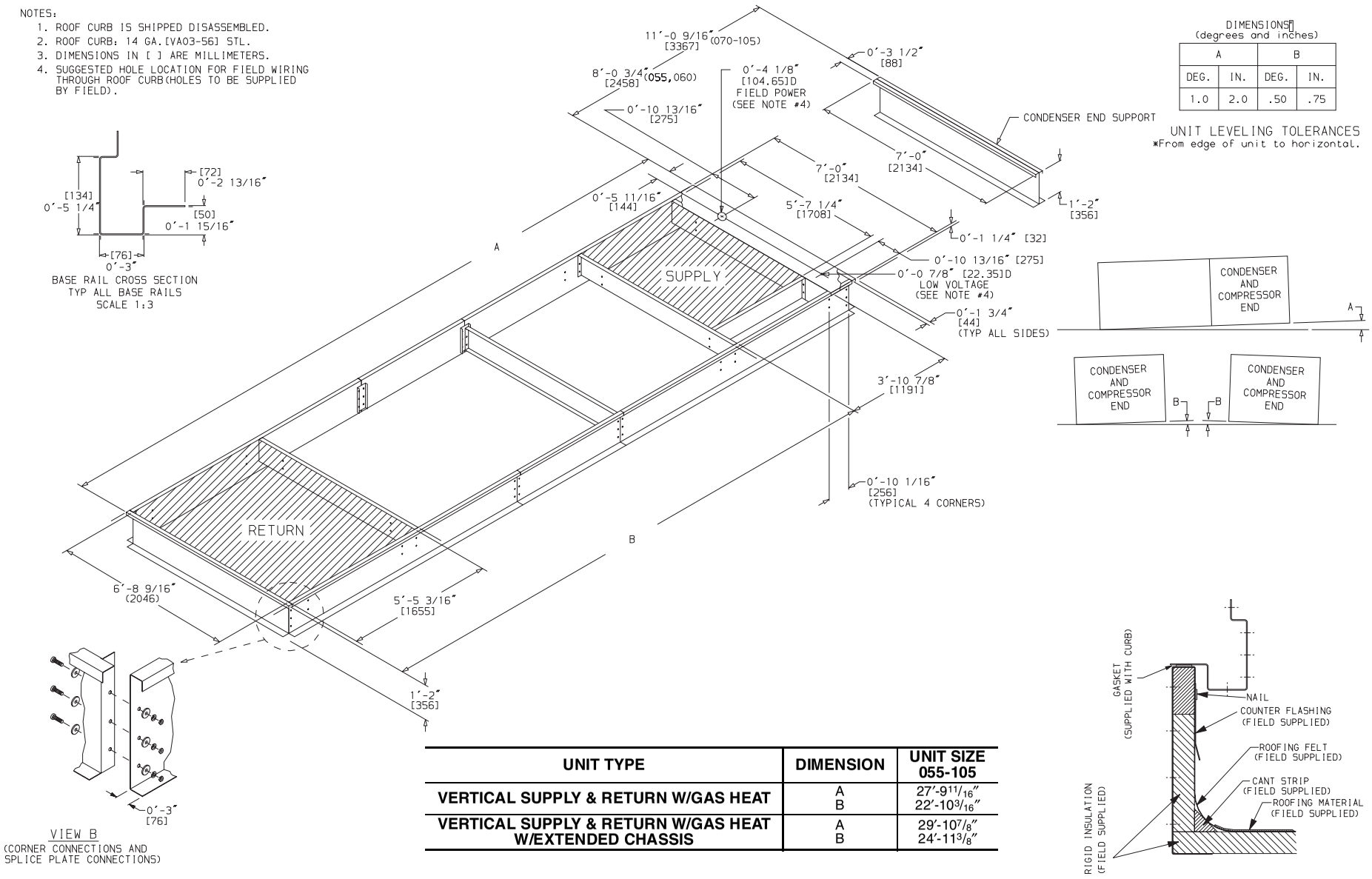
A		B	
DEG.	IN.	DEG.	IN.
1.0	2.0	.50	.75

UNIT LEVELING TOLERANCES
*From edge of unit to horizontal.



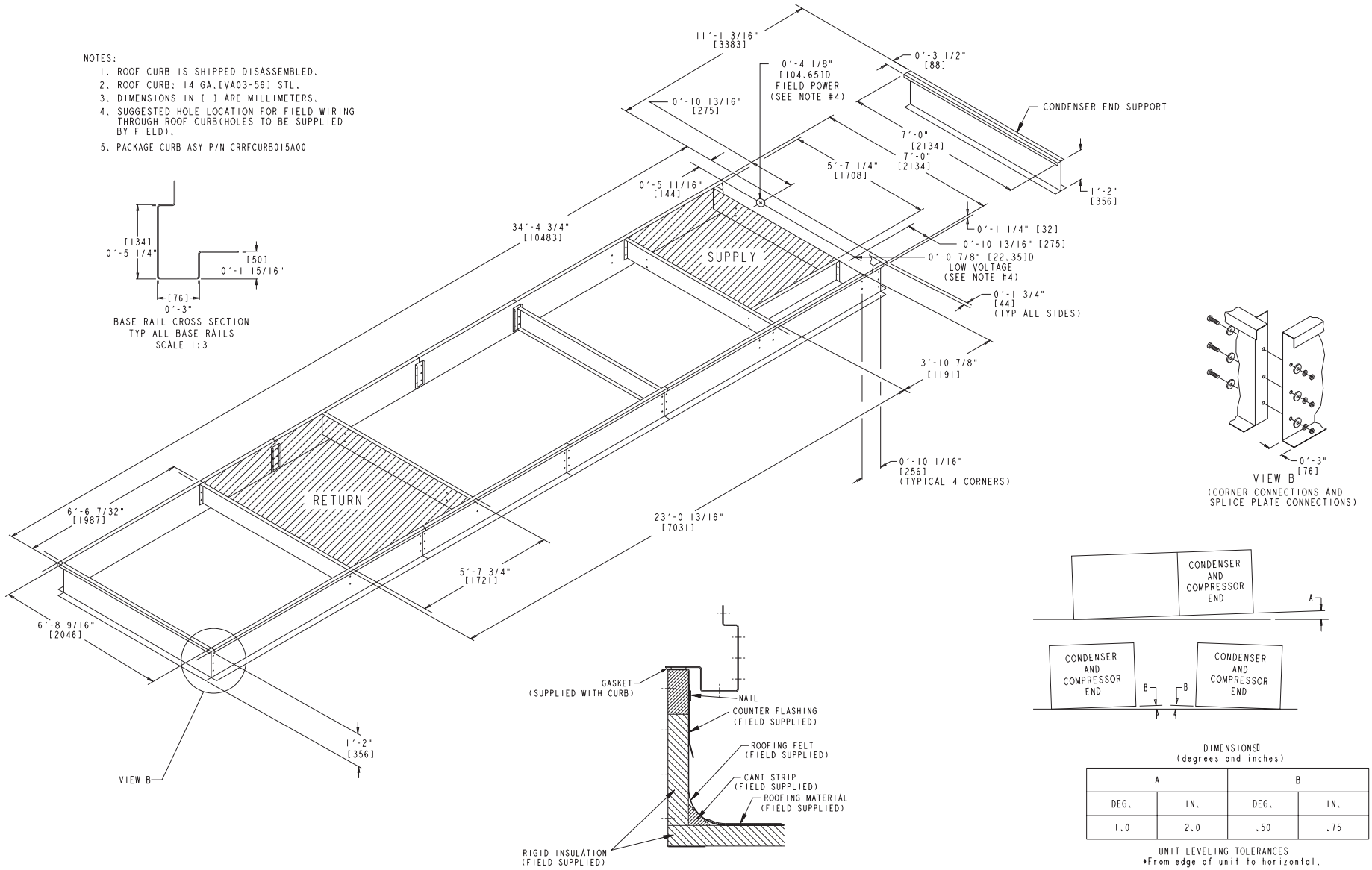
UNIT TYPE	DIMENSION	UNIT SIZE 030,035	UNIT SIZE 040,050
VERTICAL SUPPLY & RETURN W/GAS HEAT	A	21'-8 1/16"	25'-8 11/16"
	B	13'-3 11/16"	16'-0 5/8"
VERTICAL SUPPLY & RETURN W/GAS HEAT W/EXTENDED CHASSIS	A	23'-9 1/4"	27'-9 5/16"
	B	15'-4 7/16"	18'-1 7/8"

Fig. 1 — Roof Curb; Sizes 030-050



UNIT TYPE	DIMENSION	UNIT SIZE 055-105
VERTICAL SUPPLY & RETURN W/GAS HEAT	A	27'-9 11/16"
	B	22'-10 3/16"
VERTICAL SUPPLY & RETURN W/GAS HEAT W/EXTENDED CHASSIS	A	29'-10 7/8"
	B	24'-11 3/8"

Fig. 2 — Roof Curb; Sizes 055-070 and Sizes 075-105 without High Capacity Power Exhaust



DIMENSIONS*
(degrees and inches)

A		B	
DEG.	IN.	DEG.	IN.
1.0	2.0	.50	.75

UNIT LEVELING TOLERANCES
*From edge of unit to horizontal.

Fig. 3 — Roof Curb; Sizes 075-105 with High Capacity Power Exhaust

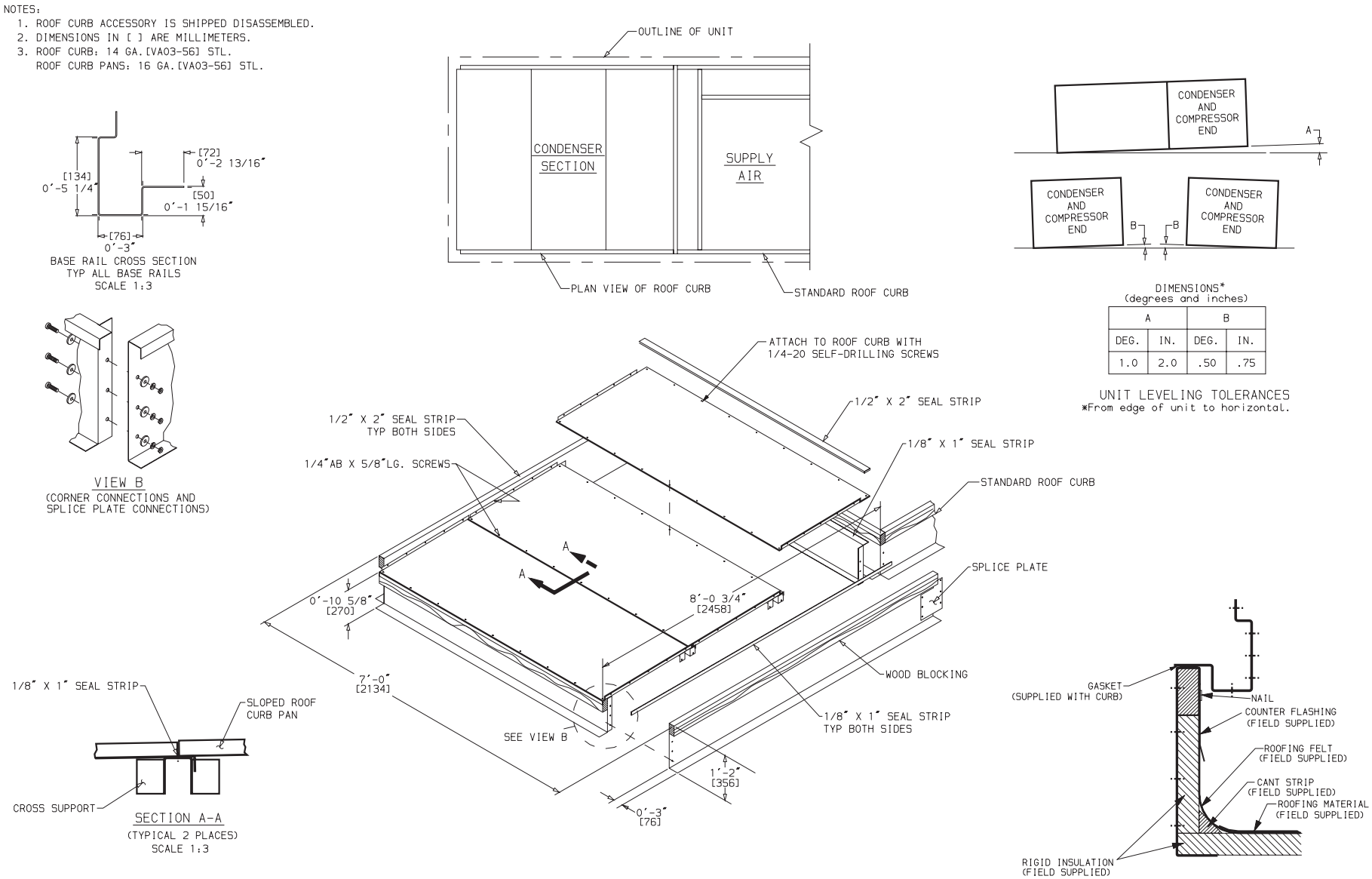
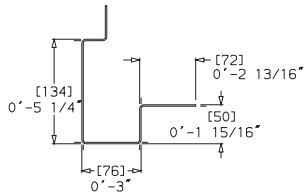
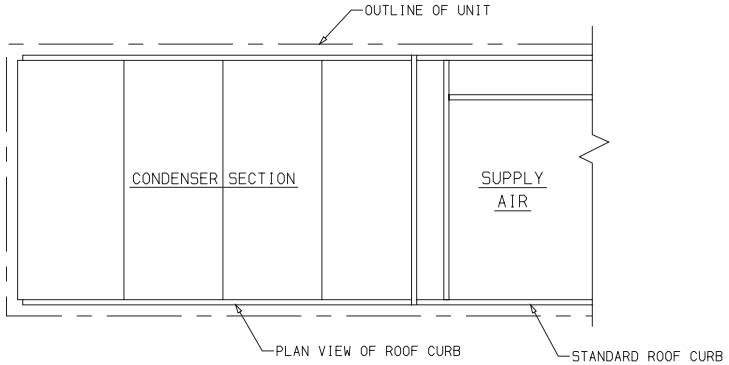


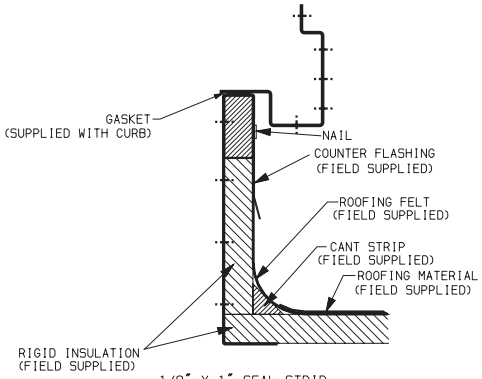
Fig. 4 — Condenser Section Roof Curb (Size 055 and 060 Only)

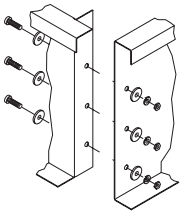
NOTES:
1. ROOF CURB ACCESSORY IS SHIPPED DISASSEMBLED.
2. DIMENSIONS IN [ ] ARE MILLIMETERS.
3. ROOF CURB: 14 GA. [VA03-56] STL.
   ROOF CURB PANS: 16 GA. [VA03-56] STL.



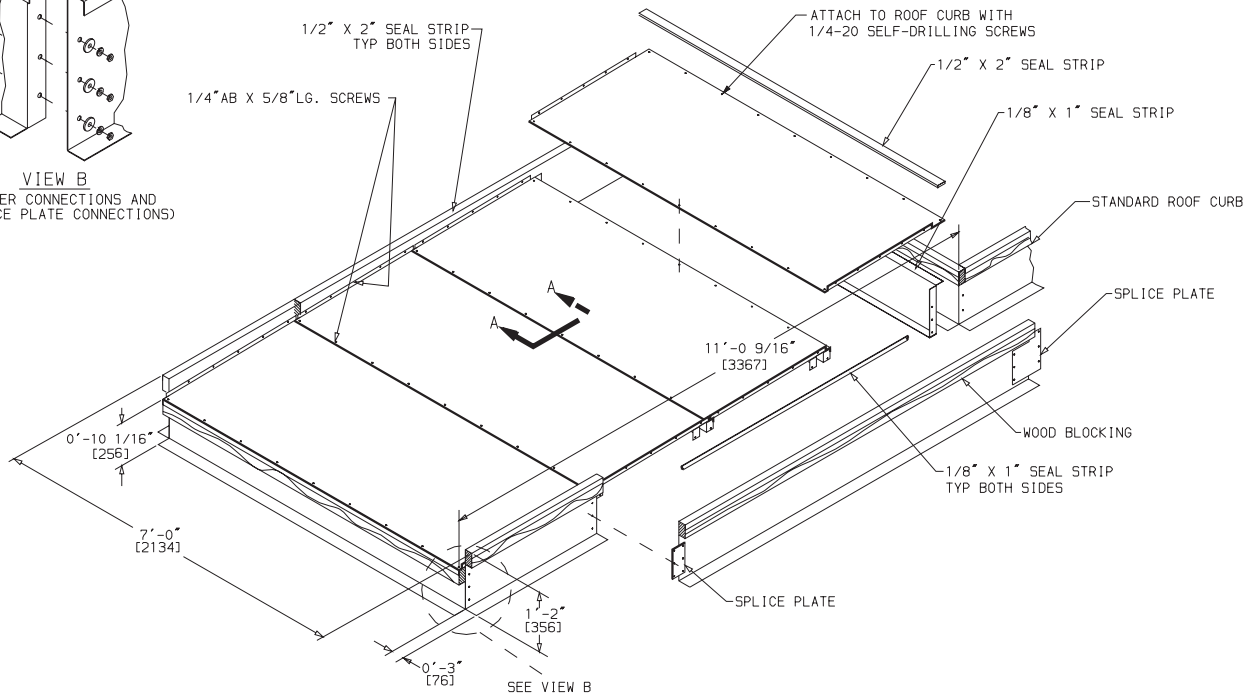
BASE RAIL CROSS SECTION
TYP ALL BASE RAILS
SCALE 1:3

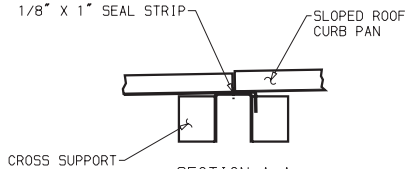




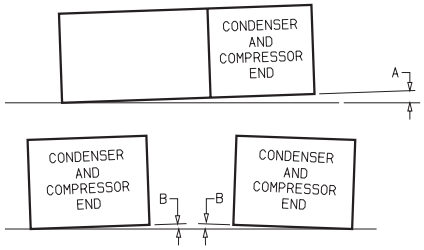


VIEW B
(CORNER CONNECTIONS AND
SPLICE PLATE CONNECTIONS)





SECTION A-A
(TYPICAL 3 PLACES)
SCALE 1:3



DIMENSIONS*
(degrees and inches)

A		B	
DEG.	IN.	DEG.	IN.
1.0	2.0	.50	.75

UNIT LEVELING TOLERANCES
*From edge of unit to horizontal.

Fig. 5 — Condenser Section Roof Curb (Size 070-105 Only)

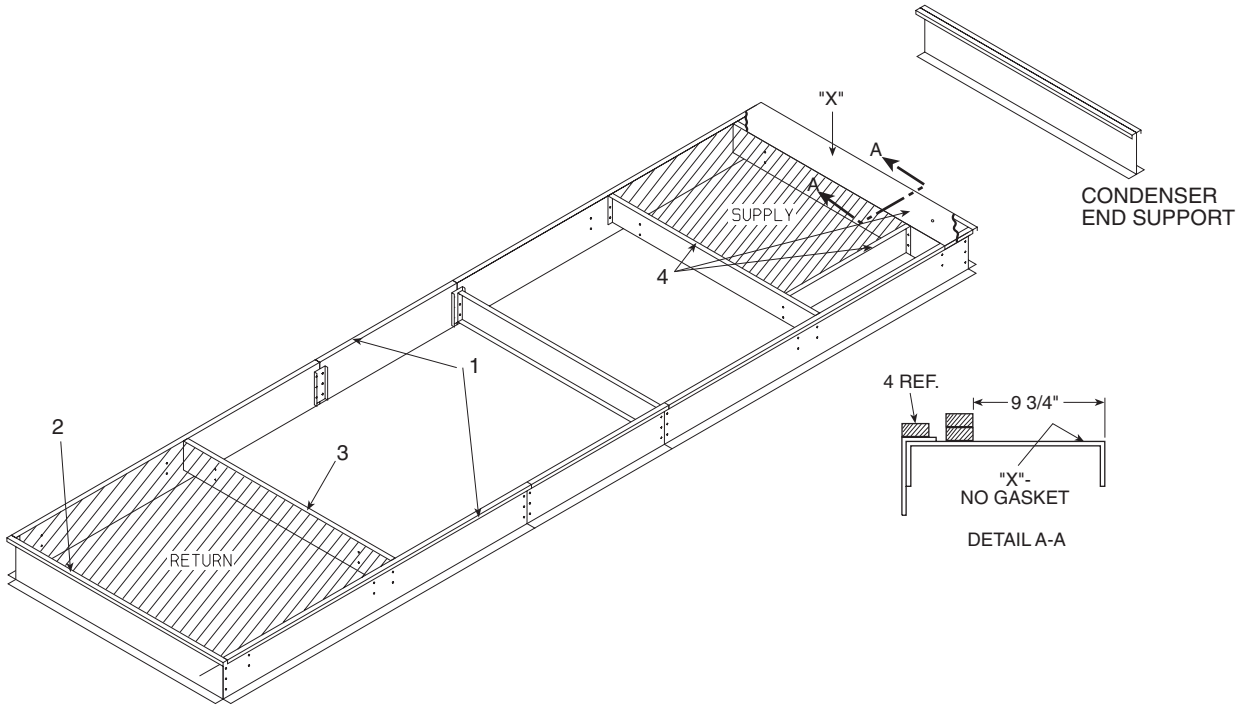


Fig. 6 — Gasket Location on Roof Curb (48ZA,ZE,ZJ055-105 and 48ZC,ZL,ZR075-105 Units)

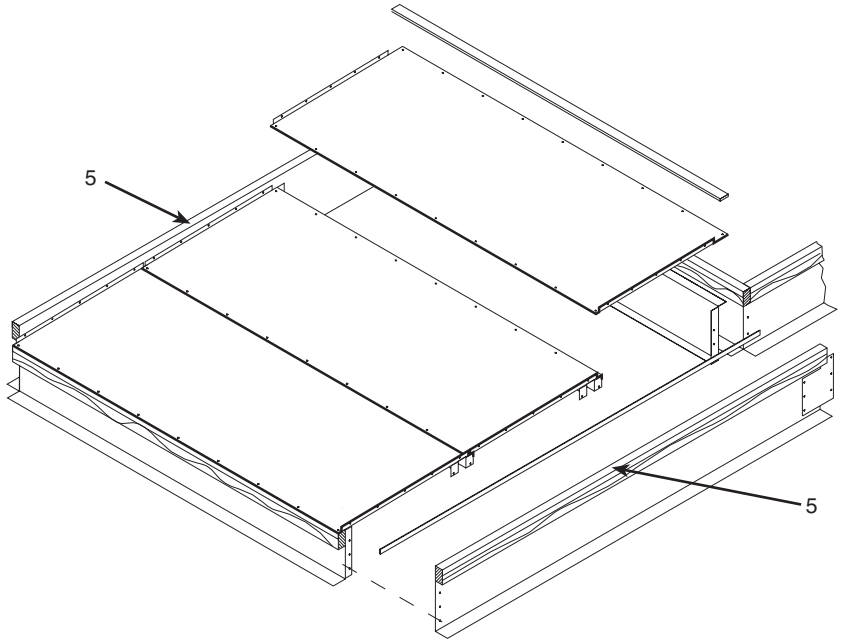


Fig. 7 — Gasket Location — Condenser Section Roof Curb (Size 055-105 Units)

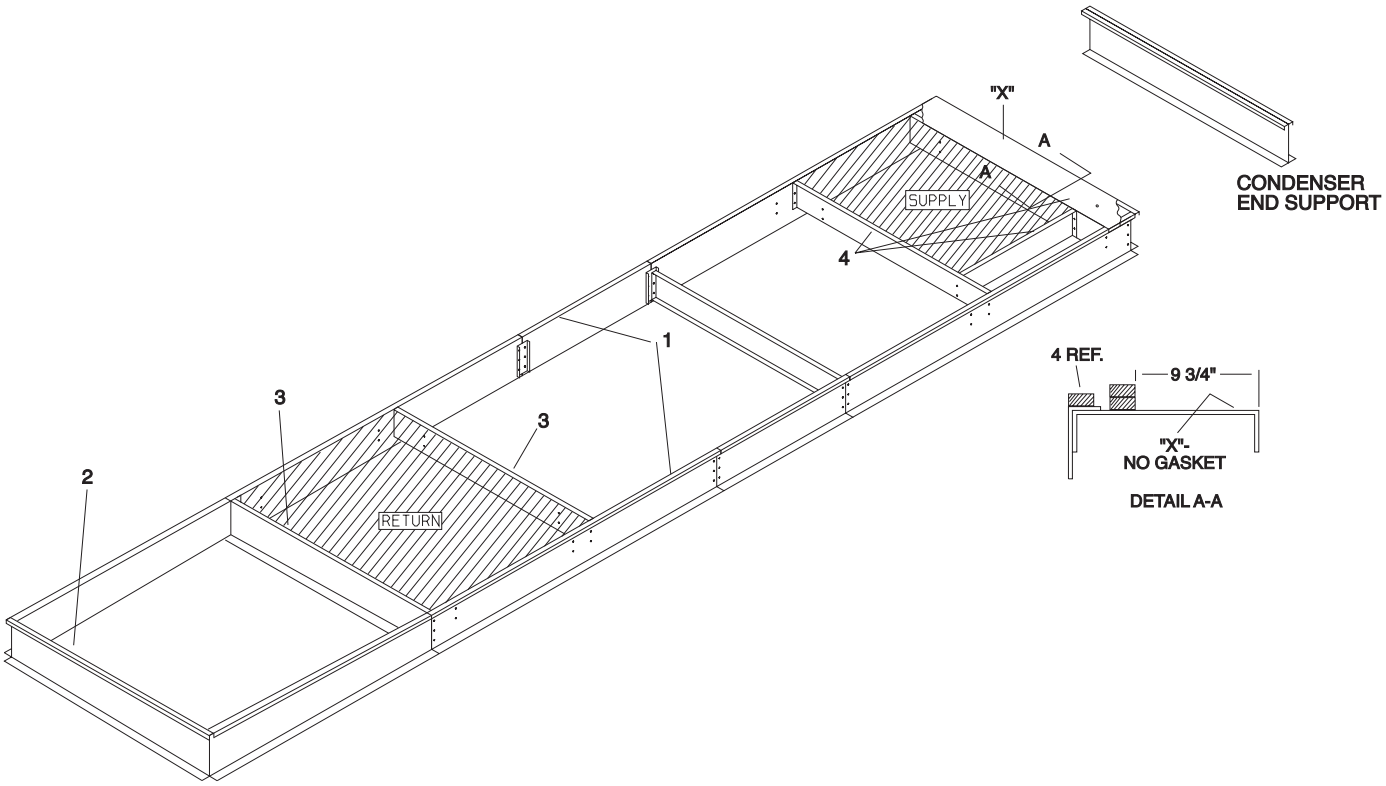


Fig. 8 — Gasket Location on Roof Curb (48ZT,ZV,ZW075-105 Units)

⚠ CAUTION

NOTICE TO RIGGERS
1. ALL PANELS MUST BE IN PLACE WHEN RIGGING.
2. DO NOT ATTEMPT TO FORK THESE UNITS.

UNIT	WEIGHT		A		B		ECONOMIZER	
	lbs	kgs	in.	mm	in.	mm	lbs	kgs
48Z030	5770	2623	83.23	2114	176.14	4474	300	136
48Z035	5895	2679	83.23	2114	177.99	4521	300	136
48Z040	6670	3032	92.64	2353	205.87	5229	300	136
48Z050	6710	3050	92.64	2353	207.01	5258	300	136

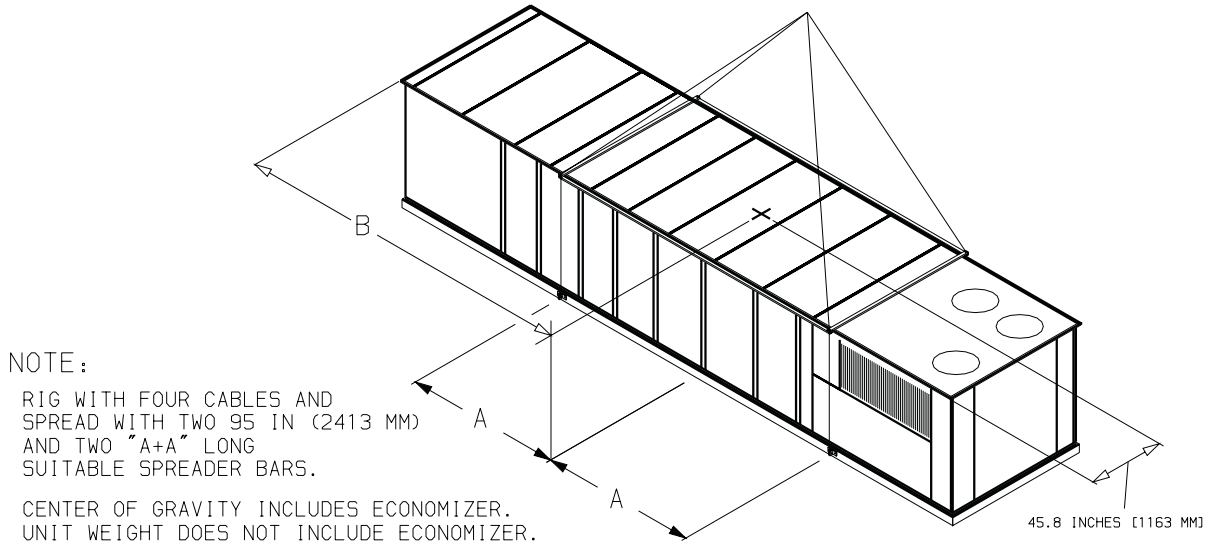


Fig. 9 — Rigging Label — Size 030-050 Units (Standard Chassis)

⚠ CAUTION

NOTICE TO RIGGERS
1. ALL PANELS MUST BE IN PLACE WHEN RIGGING.
2. DO NOT ATTEMPT TO FORK THESE UNITS.

UNIT	WEIGHT		A		B		ECONOMIZER	
	lbs	kgs	in.	mm	in.	mm	lbs	kgs
48Z055	8,820	4009	128.75	3270	235.0	5969	530	240.9
48Z060	9,120	4145	128.75	3270	235.0	5969	530	240.9
48Z070	9,550	4341	112.50	2858	252.0	6401	530	240.9
48ZA,ZE,ZJ075	10,445	4738	127.80	3247	260.6	6618	530	240.9
48ZA,ZE,ZJ090	10,655	4833	127.80	3247	262.4	6666	530	240.9
48ZA,ZE,ZJ105	11,385	5164	127.80	3247	271.0	6883	530	240.9
48ZC,ZL,ZR075	11,915	5405	127.80	3247	260.6	6618	530	240.9
48ZC,ZL,ZR090	12,125	5500	127.80	3247	262.4	6666	530	240.9
48ZC,ZL,ZR105	12,855	5831	127.80	3247	271.0	6883	530	240.9

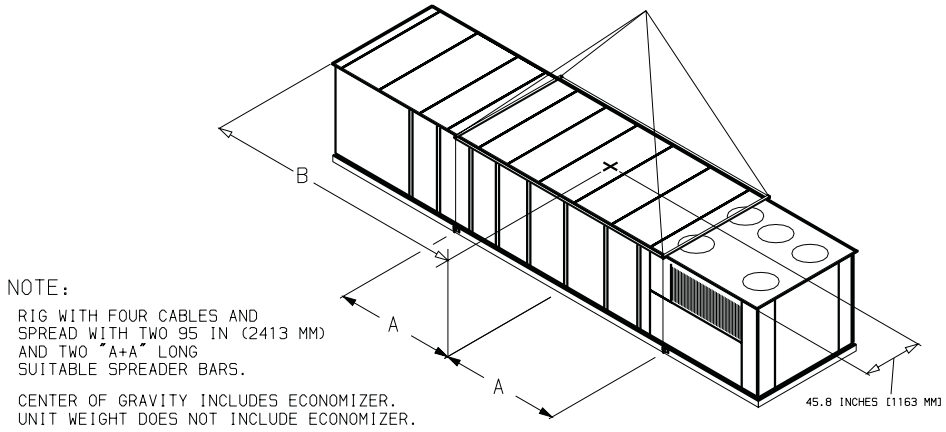


Fig. 10 — Rigging Label — Size 055-105 Units (Standard Chassis)

⚠ CAUTION

NOTICE TO RIGGERS
1. ALL PANELS MUST BE IN PLACE WHEN RIGGING.
2. DO NOT ATTEMPT TO FORK THESE UNITS.

UNIT	WEIGHT		A		B		ECONOMIZER	
	lbs	kgs	in.	mm	in.	mm	lbs	kgs
48Z030	6270	2844	95.83	2434	192.56	4891	300	136
48Z035	6395	2900	95.83	2434	194.72	4946	300	136
48Z040	7170	3252	105.24	2673	222.44	5650	300	136
48Z050	7210	3270	105.24	2673	223.50	5677	300	136

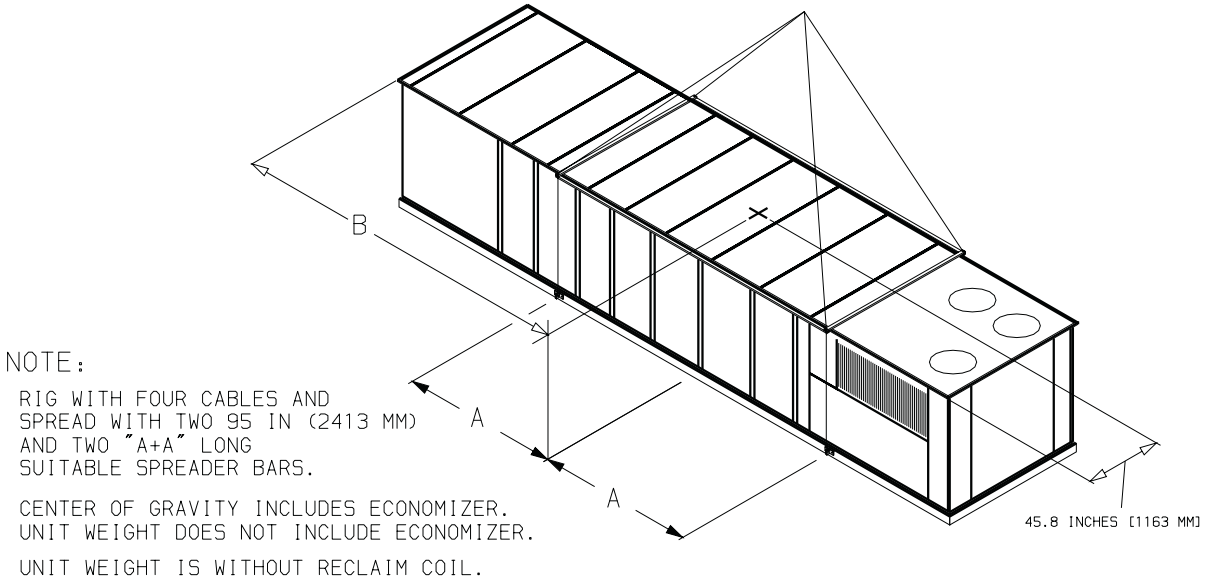


Fig. 11 — Rigging Label — Size 030-050 Units (Extended Chassis)

⚠ CAUTION

NOTICE TO RIGGERS
1. ALL PANELS MUST BE IN PLACE WHEN RIGGING.
2. DO NOT ATTEMPT TO FORK THESE UNITS.

UNIT	WEIGHT		A		B		ECONOMIZER	
	lbs	kgs	in.	mm	in.	mm	lbs	kgs
48Z055	9548	4330	121.50	3085.5	248.50	6312	530	240.9
48Z060	9668	4385	121.50	3085.5	248.50	6312	530	240.9

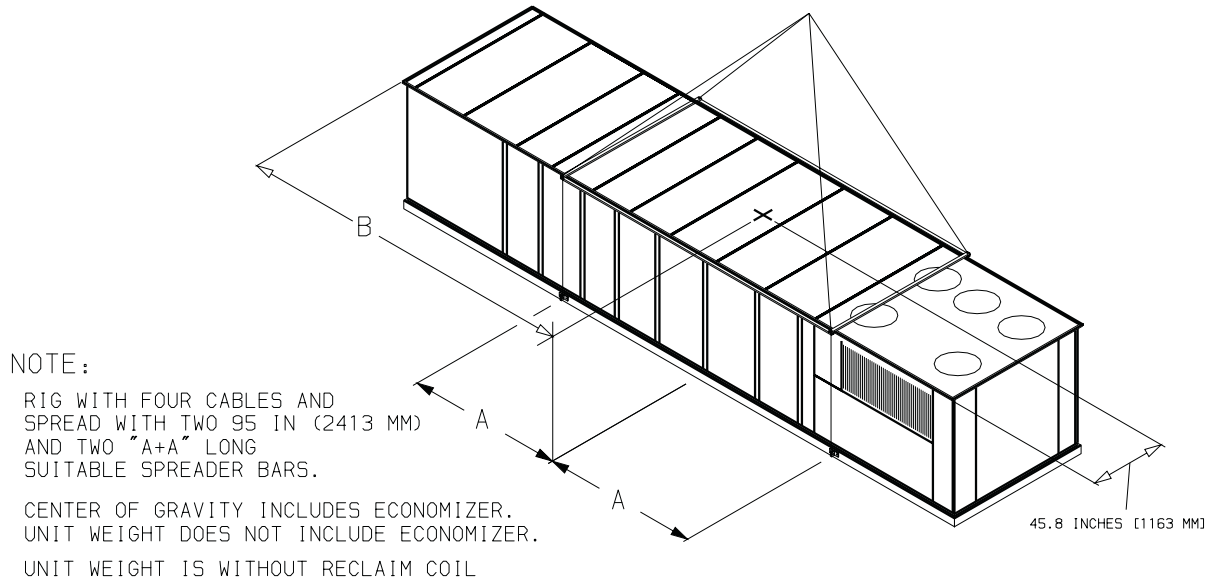


Fig. 12 — Rigging Label — Size 055,060 Units (Extended Chassis)

⚠ CAUTION

NOTICE TO RIGGERS
1. ALL PANELS MUST BE IN PLACE WHEN RIGGING.
2. DO NOT ATTEMPT TO FORK THESE UNITS.

UNIT	WEIGHT		A	
	lbs	kgs	in.	mm
48Z075	13,380	6069	298.9	7591
48Z090	13,590	6164	300.7	7637
48Z105	14,320	6495	309.9	7873

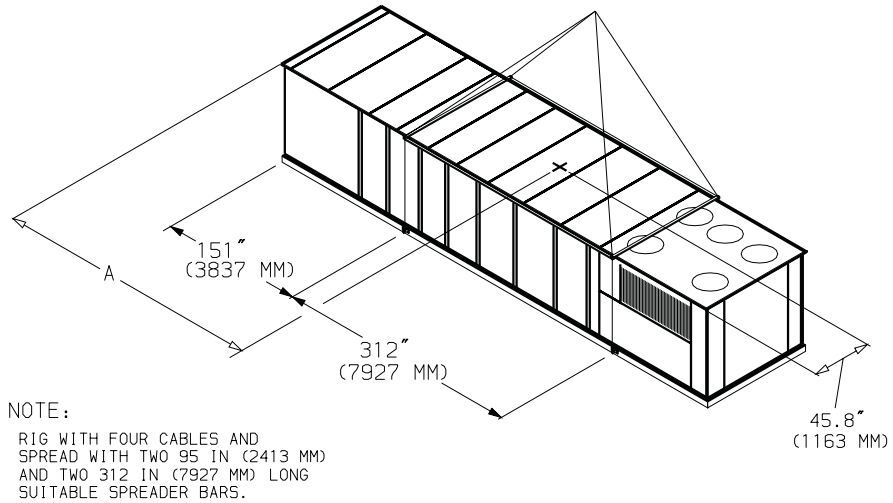
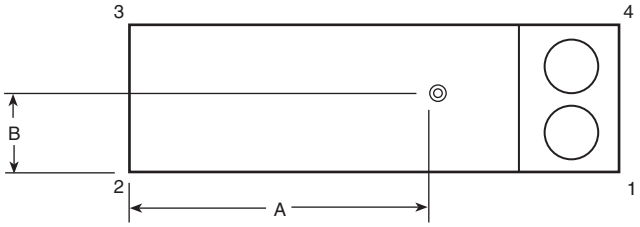


Fig. 13 — Rigging Label — 48ZT,ZV,ZW075-105 Units (High Capacity Power Exhaust Units)



UNITS 48ZA,ZE,ZJ	SIZE	CORNER WEIGHTS				TOTAL	A	B
		1	2	3	4		ft-in.	ft-in.
VERTICAL SUPPLY AND RETURN/ LOW GAS HEAT	030	1968	1004	1005	1964	5,941	14- 9 1/8	3-9 13/16
	035	1851	1184	1142	1889	6,066	14-11	3-9 13/16
	040	2246	1177	1179	2239	6,841	17- 2 7/8	3-9 13/16
	050	2264	1182	1179	2256	6,881	17- 4	3-9 13/16
	055	2478	2140	2144	2468	9,230	19- 7	3-9 13/16
	060	2557	2211	2212	2549	9,530	19- 7	3-9 13/16
	070	2648	2330	2334	2638	9,950	21- 0	3-9 13/16
	075	2955	2447	2445	2953	10,800	21- 7 1/2	3-9 13/16
	090	3035	2471	2471	3033	11,010	21- 9 7/16	3-9 13/16
	105	3342	2529	2529	3340	11,740	22- 6	3-9 13/16
VERTICAL SUPPLY AND RETURN/ HIGH GAS HEAT	030	2000	1037	1038	1995	6,070	14- 8 1/8	3-9 13/16
	035	2061	1038	1037	2059	6,195	14-10	3-9 13/16
	040	2277	1210	1213	2270	6,970	17- 1 7/8	3-9 13/16
	050	2301	1206	1205	2297	7,010	17- 3	3-9 13/16
	055	2510	2168	2172	2500	9,350	19- 7	3-9 13/16
	060	2587	2242	2237	2584	9,650	19- 7	3-9 13/16
	070	2683	2361	2365	2672	10,080	21- 0	3-9 13/16
	075	3015	2474	2472	3013	10,974	21- 8 9/16	3-9 13/16
	090	3095	2499	2498	3092	11,184	21-10 7/16	3-9 13/16
	105	3405	2554	2554	3401	11,914	22- 7	3-9 13/16
VERTICAL SUPPLY AND RETURN/ EXTENDED CHASSIS/LOW GAS HEAT	030	2133	1089	1091	2127	6,441	16- 1 11/16	3-9 13/16
	035	2198	1087	1087	2194	6,566	16- 3 7/8	3-9 13/16
	040	2411	1262	1264	2404	7,341	18- 7 1/2	3-9 13/16
	050	2434	1259	1256	2432	7,381	18- 8 5/8	3-9 13/16
	055	2617	2251	2255	2607	9,730	20- 9	3-9 13/16
	060	2698	2320	2325	2687	10,030	20- 9	3-9 13/16
VERTICAL SUPPLY AND RETURN/ EXTENDED CHASSIS/HIGH GAS HEAT	030	2188	1100	1101	2182	6,570	16- 2 3/4	3-9 13/16
	035	2187	1163	1161	2184	6,695	18- 6 7/16	3-9 13/16
	040	2454	1284	1287	2446	7,470	18- 7 1/2	3-9 13/16
	050	2017	1740	1738	2014	7,510	20- 9	3-9 13/16
	055	2649	2279	2283	2639	9,850	20- 9	3-9 13/16
	060	3442	1787	1791	3431	10,450	16- 0 9/16	3-9 13/16

UNITS 48ZT,ZV,ZW WITH HIGH-CAPACITY POWER EXHAUST	SIZE	CORNER WEIGHTS				TOTAL	A	B
		1	2	3	4		ft-in.	ft-in.
VERTICAL SUPPLY AND RETURN/ LOW GAS HEAT, HIGH-CAPACITY POWER EXHAUST	075	3551	3053	3049	3551	13,204	24- 9 13/16	3-9 13/16
	090	3629	3080	3075	3630	13,414	24- 1 5/8	3-9 13/16
	105	3948	3126	3121	3948	14,144	25- 9 1/8	3-9 13/16
VERTICAL SUPPLY AND RETURN/ HIGH GAS HEAT, CV, HIGH-CAPACITY POWER EXHAUST	075	3611	3081	3076	3611	13,380	24-10 7/8	3-9 13/16
	090	3691	3106	3102	3691	13,590	25- 0 3/4	3-9 13/16
	105	4008	3155	3150	4008	14,320	25- 9 15/16	3-9 13/16

UNITS 48ZC,ZL,ZR WITH RETURN/EXHAUST FAN	SIZE	CORNER WEIGHTS				TOTAL	A	B
		1	2	3	4		ft-in.	ft-in.
VERTICAL SUPPLY AND RETURN LOW GAS HEAT, RETURN/EXHAUST FAN	075	2802	3002	3008	2868	11,740	19-4	3-9 13/16
	090	2940	3029	3035	2946	11,950	19-6	3-9 13/16
	105	3242	3091	3098	3249	12,680	20-2	3-9 13/16
VERTICAL SUPPLY AND RETURN HIGH GAS HEAT, RETURN/EXHAUST FAN	075	2921	3029	3036	2928	11,914	19-6	3-9 13/16
	090	2999	3056	3063	3006	12,124	19-7	3-9 13/16
	105	3304	3116	3123	3311	12,854	20-4	3-9 13/16

Fig. 14 — Weight Distribution and Center of Gravity

Condensate Drain Connections — There is a total of three drain connections required on each unit: one primary (on right-hand side of the unit) and two secondary drains (one on each side of the unit).

PRIMARY DRAIN — The primary drain is a 2-in., NPT pipe connection located on the right hand side of the unit. See Fig. 15-24.

With field-supplied fittings and pipe sections, plumb the primary condensate drain to the 2-in. FPT connector on the base rail. Use a trap height of at least 4-in. for size 030-070 units and 7-in. for size 075-105 units. See Fig. 25. Install with a height dimension, from the top of the exit pipe from the trap section to the bottom of the connector, of at least 2-inches. Apply a bead of RTV or similar sealant around the pipe joint at the connector in the base rail.

SECONDARY DRAINS (Units Installed on Curb) — Sizes 030 and 035 are provided with two secondary drains (one on each side of unit). Sizes 040-105 are provided with a total of four secondary drain locations: two on each side (at locations designated as A and B in Fig. 26). Selection of which drains to pipe (and which to seal) is based on the installed pitch of the unit. Determine pitch direction of curb or unit, then refer to Fig. 26 and 27 and determine action required at each base rail hole location.

Locate the $1^{1}/_{4}$-in. drain coupling assemblies, seal plates and mounting screws (shipped in a bag taped to the basepan in the supply fan section, located behind the access panel marked FAN SECTION). The drain couplings are a 10-gage plate with a $1^{1}/_{4}$-in. half coupling welded to the plate. Seal plates are 16-gage, used to cover drain hole openings which are not being used.

At each secondary drain hole location, there is a $1^{3}/_{8}$-in. hole pre-drilled in the bottom of the base rail, surrounded by four 0.20-in. engagement holes. Where a secondary drain will be piped (per Fig. 26), install a drain coupling assembly. Where a pre-drilled hole will be sealed, install a seal plate.

Where a piped connection will be made, attach a drain coupling assembly to the bottom of the base rail using 4 screws provided. See Fig. 28. Using field-supplied fittings and pipe sections, assemble U-traps at each secondary drain fitting. Provide a minimum size of $^{1}/_{2}$-in. pipe for secondary drains.

NOTE: Use a trap at least 4-in. deep for size 030-070 units and 7-in. for size 075-105 units.

Cover the remaining drain holes with the seal plates and screws provided. See Fig. 29. Apply a bead of RTV or similar sealant around the drain assemblies and seal plates where they attach to the base rail. See Fig. 30.

Consult local plumbing codes for direction on joining multiple drain lines. Total size of any combined line does not need to exceed nominal 2-in. size of primary drain connection.

Fill the U-traps at the secondary drain locations prior to unit start-up. Also check the U-traps before each season to ensure the traps are filled and functioning properly.

SECONDARY DRAINS (Units Installed on Steel Beam or Slab) — Prior to final positioning, apply a bead of sealant around each drain hole in the base rail. Then position the unit into final location.

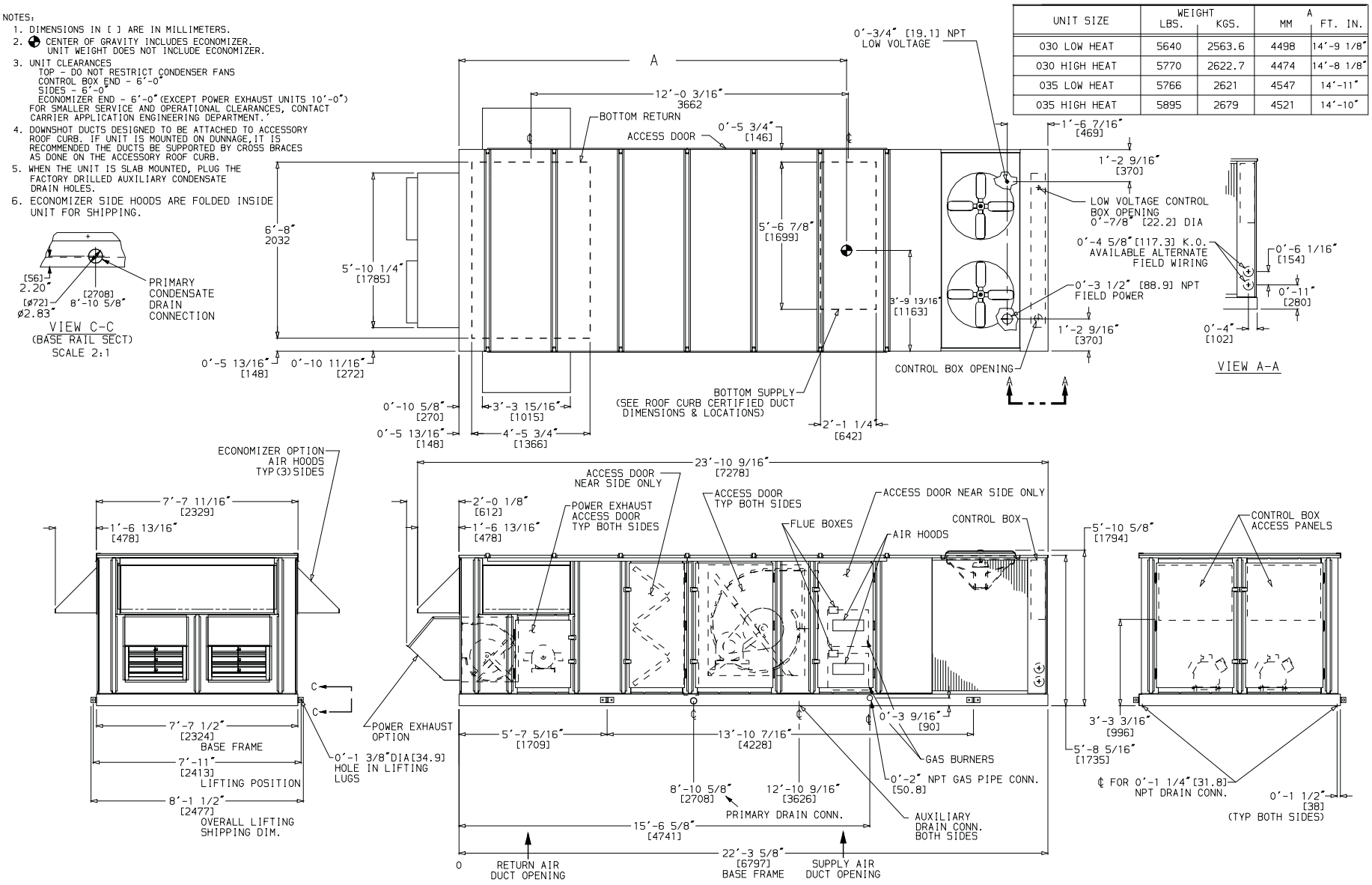
After final positioning of unit, perform the following procedure:

1. Locate the appropriate drain locations (per Fig. 26) and select locations marked as “Pipe.” Secondary drains will be required on both sides. Measure from the unit Return Air end and mark the base rails.
2. Position the drain coupling assembly on the base rail. Mark the screw holes and the drain hole locations on the base rail.
3. Drill holes for drain outlet (use $1^{3}/_{8}$-in. hole saw) and for screws (use $^{3}/_{16}$-in. drill bit).
4. Using field-supplied fittings and pipe sections, assemble U-traps at each secondary drain fitting. Provide a minimum size of $^{1}/_{2}$-in. pipe for secondary drains.

   NOTE: Use a trap at least 4-in. deep for size 030-070 units and 7-in. for size 075-105 units.
5. Apply a bead of RTV or similar sealant around the drain assemblies where they attach to the base rail. See Fig. 25.

Consult local plumbing codes for direction on joining multiple drain lines. Total size of any combined line does not need to exceed nominal 2-in. size of primary drain connection.

Fill the U-traps at the secondary drain locations prior to unit start-up. Also check the U-traps before each season to ensure the traps are filled and functioning properly.


NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. CENTER OF GRAVITY INCLUDES ECONOMIZER. UNIT WEIGHT DOES NOT INCLUDE ECONOMIZER.
3. UNIT CLEARANCES
TOP - DO NOT RESTRICT CONDENSER FANS
CONTROL BOX END - 6'-0"
SIDES - 6'-0"
ECONOMIZER END - 6'-0" (EXCEPT POWER EXHAUST UNITS 10'-0")
FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
4. DOWNSHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB. IF UNIT IS MOUNTED ON DUNNAGE, IT IS RECOMMENDED THE DUCTS BE SUPPORTED BY CROSS BRACES AS DONE ON THE ACCESSORY ROOF CURB.
5. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
6. ECONOMIZER SIDE HOODS ARE FOLDED INSIDE UNIT FOR SHIPPING.
VIEW C-C
(BASE RAIL SECT)
SCALE 2:1
PRIMARY CONDENSATE DRAIN CONNECTION
A
12'-0 3/16" 3662
BOTTOM RETURN
ACCESS DOOR
0'-5 3/4" [146]
0'-3/4" [19.1] NPT LOW VOLTAGE
1'-6 7/16" [469]
1'-2 9/16" [370]
LOW VOLTAGE CONTROL BOX OPENING 0'-7/8" [22.2] DIA
0'-4 5/8" [117.3] K.O. AVAILABLE ALTERNATE FIELD WIRING
0'-6 1/16" [154]
0'-3 1/2" [88.9] NPT FIELD POWER
0'-11" [280]
0'-4" [102]
VIEW A-A
6'-8" 2032
5'-10 1/4" [1785]
5'-6 7/8" [1699]
3'-9 13/16" [1163]
CONTROL BOX OPENING
0'-5 13/16" [148]
0'-10 11/16" [272]
0'-10 5/8" [270]
3'-3 15/16" [1015]
0'-5 13/16" [148]
4'-5 3/4" [1366]
BOTTOM SUPPLY (SEE ROOF CURB CERTIFIED DUCT DIMENSIONS & LOCATIONS)
2'-1 1/4" [642]
ECONOMIZER OPTION AIR HOODS TYP (3) SIDES
23'-10 9/16" [7278]
ACCESS DOOR NEAR SIDE ONLY
ACCESS DOOR TYP BOTH SIDES
ACCESS DOOR NEAR SIDE ONLY
2'-0 1/8" [612]
1'-6 13/16" [478]
POWER EXHAUST ACCESS DOOR TYP BOTH SIDES
FLUE BOXES
CONTROL BOX
AIR HOODS
CONTROL BOX ACCESS PANELS
5'-10 5/8" [1794]
7'-7 11/16" [2329]
1'-6 13/16" [478]
POWER EXHAUST OPTION
0'-3 9/16" [90]
5'-7 5/16" [1709]
13'-10 7/16" [4228]
GAS BURNERS
0'-2" NPT GAS PIPE CONN. [50.8]
3'-3 3/16" [996]
5'-8 5/16" [1735]
℄ FOR 0'-1 1/4" [31.8] NPT DRAIN CONN.
0'-1 1/2" [38] (TYP BOTH SIDES)
7'-7 1/2" [2324] BASE FRAME
7'-11" [2413] LIFTING POSITION
8'-1 1/2" [2477] OVERALL LIFTING SHIPPING DIM.
0'-1 3/8" DIA [34.9] HOLE IN LIFTING LUGS
8'-10 5/8" [2708]
12'-10 9/16" [3626]
PRIMARY DRAIN CONN.
AUXILIARY DRAIN CONN. BOTH SIDES
15'-6 5/8" [4741]
22'-3 5/8" [6797] BASE FRAME
RETURN AIR DUCT OPENING
SUPPLY AIR DUCT OPENING

UNIT SIZE	WEIGHT LBS.	WEIGHT KGS.	A MM	A FT. IN.
030 LOW HEAT	5640	2563.6	4498	14'-9 1/8"
030 HIGH HEAT	5770	2622.7	4474	14'-8 1/8"
035 LOW HEAT	5766	2621	4547	14'-11"
035 HIGH HEAT	5895	2679	4521	14'-10"

Fig. 15 — Base Unit Dimensional Drawing — 48ZA,ZE,ZJ030,035 (Standard Chassis)

NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. ⊕ CENTER OF GRAVITY INCLUDES ECONOMIZER. UNIT WEIGHT DOES NOT INCLUDE ECONOMIZER.
3. UNIT CLEARANCES
   TOP - DO NOT RESTRICT CONDENSER FANS
   CONTROL BOX END - 6'-0"
   SIDES - 6'-0"
   ECONOMIZER END - 6'-0" (EXCEPT POWER EXHAUST UNITS 10'-0") FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
4. DOWNSHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB. IF UNIT IS MOUNTED ON DUNNAGE, IT IS RECOMMENDED THE DUCTS BE SUPPORTED BY CROSS BRACES AS DONE ON THE ACCESSORY ROOF CURB.
5. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
6. ECONOMIZER SIDE HOODS ARE FOLDED INSIDE UNIT FOR SHIPPING.

UNIT SIZE	WEIGHT LBS.	WEIGHT KGS.	A MM	A FT. IN.
040 LOW HEAT	6540	2972.7	5255	17'-2 7/8"
040 HIGH HEAT	6670	3031.8	5229	17'-1 7/8"
050 LOW HEAT	6581	2991	5283	17' -4"
050 HIGH HEAT	6710	3050	5258	17' -3"

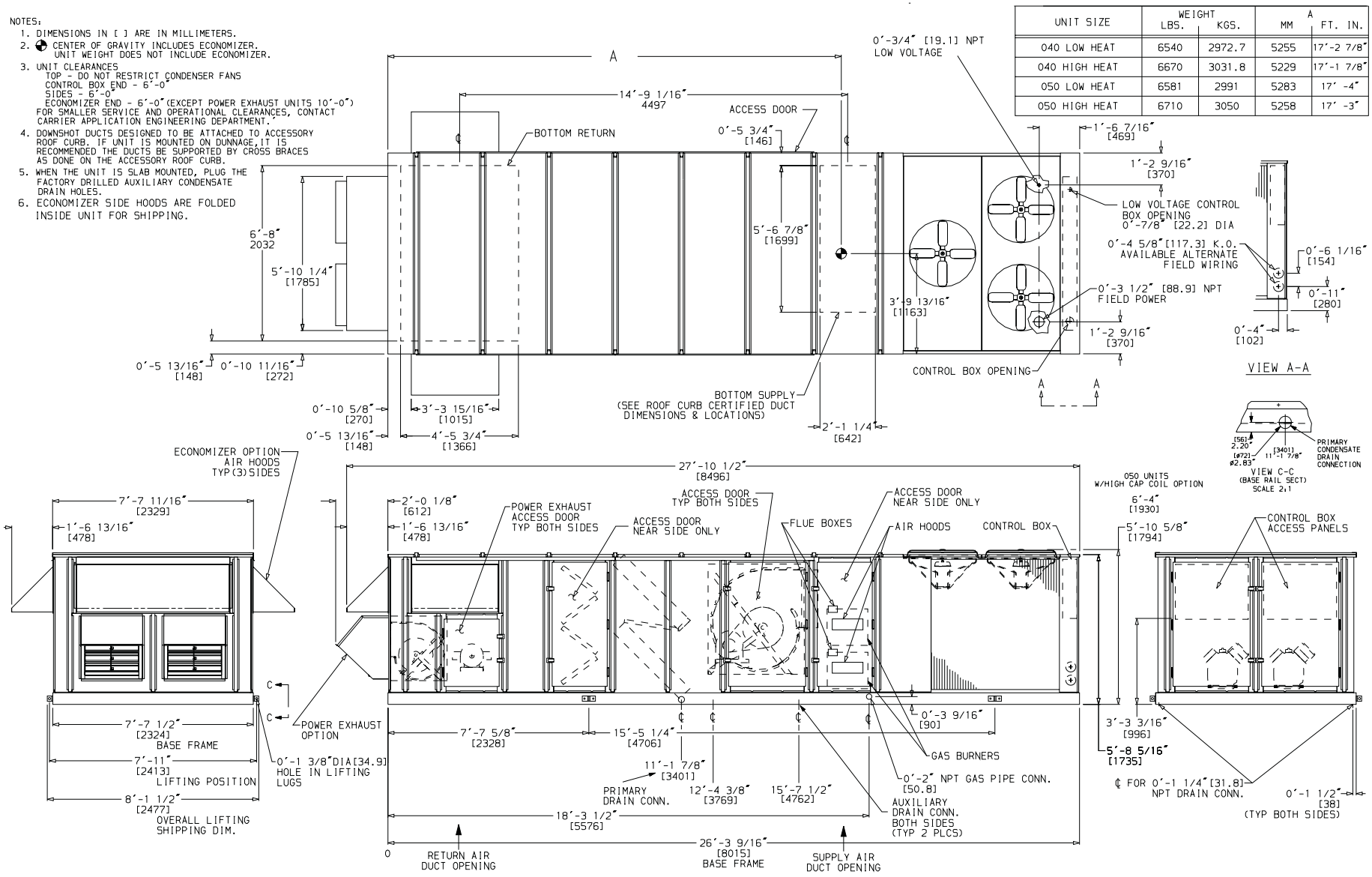


Fig. 16 — Base Unit Dimensional Drawing — 48ZA,ZE,ZJ040,050 (Standard Chassis)

UNIT SIZE	WEIGHT LBS.	WEIGHT KGS.	A MM	A FT.-IN.	B MM	B FT.-IN.	C MM	C FT.-IN.	D MM	D FT.-IN.	E MM	E FT.-IN.	F MM	F FT.-IN.
055 LOW HEAT	8700	3955	2718	8'-11"	6541	21'-5 1/2"	5969	19'-7"	1163	3'-9 13/16"	11140	36'-6 9/16"	11524	37'-9 11/16"
060 LOW HEAT	9000	4091	2718	8'-11"	6541	21'-5 1/2"	5969	19'-7"	1163	3'-9 13/16"	11140	36'-6 9/16"	11524	37'-9 11/16"
070 LOW HEAT	9420	4282	3543	11'-7 1/2"	5715	18'-9"	6401	21'-0"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
055 HIGH HEAT	8820	4009	2718	8'-11"	6541	21'-5 1/2"	5969	19'-7"	1163	3'-9 13/16"	11140	36'-6 9/16"	11524	37'-9 11/16"
060 HIGH HEAT	9120	4145	2718	8'-11"	6541	21'-5 1/2"	5969	19'-7"	1163	3'-9 13/16"	11140	36'-6 9/16"	11524	37'-9 11/16"
070 HIGH HEAT	9550	4341	3543	11'-7 1/2"	5715	18'-9"	6401	21'-0"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"

NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. ⊕ CENTER OF GRAVITY INCLUDES ECONOMIZER. UNIT WEIGHT DOES NOT INCLUDE ECONOMIZER.
3. UNIT CLEARANCES
   TOP - DO NOT RESTRICT CONDENSER FANS
   CONTROL BOX END - 6'-0"
   SIDES - 6'-0"
   ECONOMIZER END - 6'-0" (EXCEPT POWER EXHAUST UNITS 10'-0")
   FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
4. DOWNSHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB. IF UNIT IS MOUNTED ON DUNNAGE, IT IS RECOMMENDED THE DUCTS BE SUPPORTED BY CROSS BRACES AS DONE ON THE ACCESSORY ROOF CURB.
5. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
6. ECONOMIZER SIDE HOODS ARE FOLDED INSIDE UNIT FOR SHIPPING.

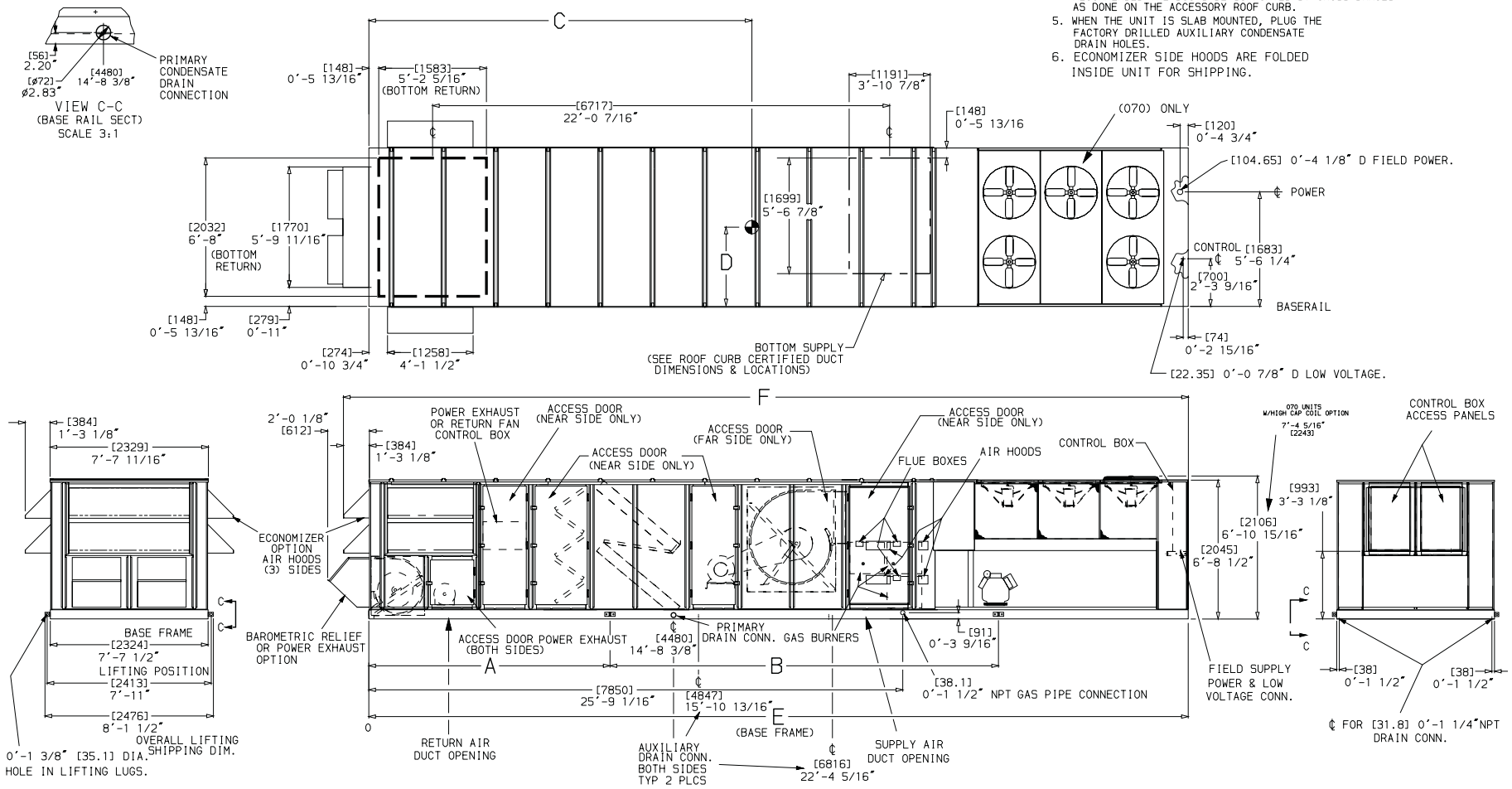

VIEW C-C
(BASE RAIL SECT)
SCALE 3:1
PRIMARY CONDENSATE DRAIN CONNECTION
BOTTOM SUPPLY
(SEE ROOF CURB CERTIFIED DUCT DIMENSIONS & LOCATIONS)
(070) ONLY
POWER
CONTROL
BASERAIL
[104.65] 0'-4 1/8" D FIELD POWER.
[22.35] 0'-0 7/8" D LOW VOLTAGE.
ECONOMIZER OPTION AIR HOODS (3) SIDES
BAROMETRIC RELIEF OR POWER EXHAUST OPTION
POWER EXHAUST OR RETURN FAN CONTROL BOX
ACCESS DOOR (NEAR SIDE ONLY)
ACCESS DOOR (FAR SIDE ONLY)
ACCESS DOOR POWER EXHAUST (BOTH SIDES)
PRIMARY DRAIN CONN. GAS BURNERS
FLUE BOXES
AIR HOODS
CONTROL BOX
070 UNITS W/HIGH CAP COIL OPTION
CONTROL BOX ACCESS PANELS
FIELD SUPPLY POWER & LOW VOLTAGE CONN.
[38.1] 0'-1 1/2" NPT GAS PIPE CONNECTION
BASE FRAME
LIFTING POSITION
OVERALL LIFTING SHIPPING DIM.
0'-1 3/8" [35.1] DIA. HOLE IN LIFTING LUGS.
RETURN AIR DUCT OPENING
AUXILIARY DRAIN CONN. BOTH SIDES TYP 2 PLCS
SUPPLY AIR DUCT OPENING
(BASE FRAME)
℄ FOR [31.8] 0'-1 1/4" NPT DRAIN CONN.

Fig. 17 — Base Unit Dimensional Drawing — 48ZA,ZE,ZJ055-070 (Standard Chassis)

UNIT SIZE	WEIGHT		A		B		C		D		E		F	
	LBS.	KGS.	MM	FT. IN.	MM	FT. IN.	MM	FT. IN.	MM	FT. IN.	MM	FT. IN.	MM	FT. IN.
075 LOW HEAT	10270	4658	3544	11'-7 1/2"	6494	21' 3 5/8"	6592	21'-7 1/2"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
090 LOW HEAT	10480	4754	3544	11'-7 1/2"	6494	21' 3 5/8"	6641	21'-9 7/16"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
105 LOW HEAT	11210	5085	3544	11'-7 1/2"	6494	21' 3 5/8"	6861	22'-6 1/8"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
075 HIGH HEAT	10445	4738	3544	11'-7 1/2"	6494	21' 3 5/8"	6618	21'-8 9/16"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
090 HIGH HEAT	10655	4833	3544	11'-7 1/2"	6494	21' 3 5/8"	6666	21'-10 7/16"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
105 HIGH HEAT	11385	5164	3544	11'-7 1/2"	6494	21' 3 5/8"	6883	22' -7"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"

NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. ⊕ CENTER OF GRAVITY INCLUDES ECONOMIZER. UNIT WEIGHT DOES NOT INCLUDE ECONOMIZER.
3. UNIT CLEARANCES
   TOP - DO NOT RESTRICT CONDENSER FANS
   CONTROL BOX END - 6'-0"
   SIDES - 6'-0"
   ECONOMIZER END - 6'-0" (EXCEPT POWER EXHAUST UNITS 10'-0")
   FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
4. DOWNSHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB. IF UNIT IS MOUNTED ON DUNNAGE, IT IS RECOMMENDED THE DUCTS BE SUPPORTED BY CROSS BRACES AS DONE ON THE ACCESSORY ROOF CURB.
5. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
6. ECONOMIZER SIDE HOODS ARE FOLDED INSIDE UNIT FOR SHIPPING.

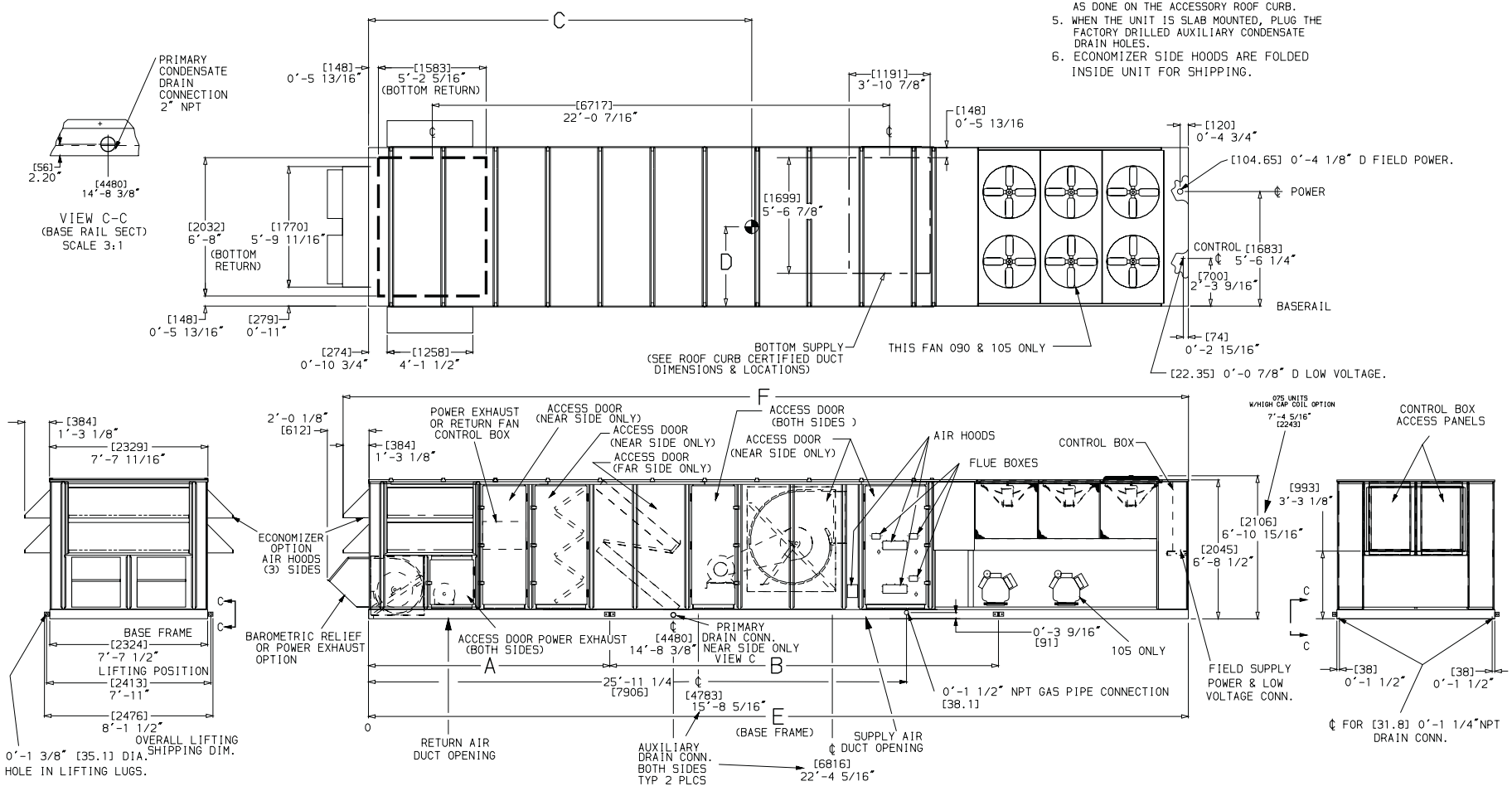

PRIMARY CONDENSATE DRAIN CONNECTION 2" NPT
VIEW C-C (BASE RAIL SECT) SCALE 3:1
BOTTOM RETURN
BOTTOM SUPPLY (SEE ROOF CURB CERTIFIED DUCT DIMENSIONS & LOCATIONS)
THIS FAN 090 & 105 ONLY
[104.65] 0'-4 1/8" D FIELD POWER.
POWER
CONTROL
BASERAIL
[22.35] 0'-0 7/8" D LOW VOLTAGE.
ECONOMIZER OPTION AIR HOODS (3) SIDES
BAROMETRIC RELIEF OR POWER EXHAUST OPTION
POWER EXHAUST OR RETURN FAN CONTROL BOX
ACCESS DOOR (NEAR SIDE ONLY)
ACCESS DOOR (FAR SIDE ONLY)
ACCESS DOOR (BOTH SIDES)
AIR HOODS
FLUE BOXES
CONTROL BOX
075 UNITS W/HIGH CAP COIL OPTION
CONTROL BOX ACCESS PANELS
BASE FRAME
LIFTING POSITION
OVERALL LIFTING SHIPPING DIM.
HOLE IN LIFTING LUGS.
ACCESS DOOR POWER EXHAUST (BOTH SIDES)
PRIMARY DRAIN CONN. NEAR SIDE ONLY VIEW C
105 ONLY
FIELD SUPPLY POWER & LOW VOLTAGE CONN.
0'-1 1/2" NPT GAS PIPE CONNECTION
RETURN AIR DUCT OPENING
AUXILIARY DRAIN CONN. BOTH SIDES TYP 2 PLCS
SUPPLY AIR DUCT OPENING
(BASE FRAME)
℄ FOR [31.8] 0'-1 1/4" NPT DRAIN CONN.

Fig. 18 — Base Unit Dimensional Drawing — 48ZA,ZE,ZJ075-105 (Standard Chassis)

NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. ⊕ CENTER OF GRAVITY INCLUDES ECONOMIZER. UNIT WEIGHT DOES NOT INCLUDE ECONOMIZER.
3. UNIT CLEARANCES
   TOP - DO NOT RESTRICT CONDENSER FANS
   CONTROL BOX END - 6'-0"
   SIDES - 6'-0"
   ECONOMIZER END - 6'-0" (EXCEPT POWER EXHAUST UNITS 10'-0") FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
4. DOWNSHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB. IF UNIT IS MOUNTED ON DUNNAGE, IT IS RECOMMENDED THE DUCTS BE SUPPORTED BY CROSS BRACES AS DONE ON THE ACCESSORY ROOF CURB.
5. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
6. ECONOMIZER SIDE HOODS ARE FOLDED INSIDE UNIT FOR SHIPPING.
7. COIL DIMENSIONS (MAXIMUM)
   -LENGTH (HEADER INCLUDED): 7'-0 1/4"
   -WIDTH : 0' -9 5/8"
   -HEIGHT: 4' 5 15/16"
8. HEAT RECLAIM COIL FIELD SUPPLIED AND INSTALLED.
9. PIPE CHASE LOCATIONS ARE RECOMMENDATIONS ONLY. OPENINGS ARE NOT FACTORY PROVIDED

UNIT SIZE	WEIGHT LBS.	WEIGHT KGS.	A MM	A FT. IN.
030 LOW HEAT	6140	2785	4918	16' -1 11/16"
030 HIGH HEAT	6270	2844	4891	16' -0 9/16"
035 LOW HEAT	6266	2841	4974	16' -3 7/8"
035 HIGH HEAT	6395	2900	4946	16' -2 3/4"

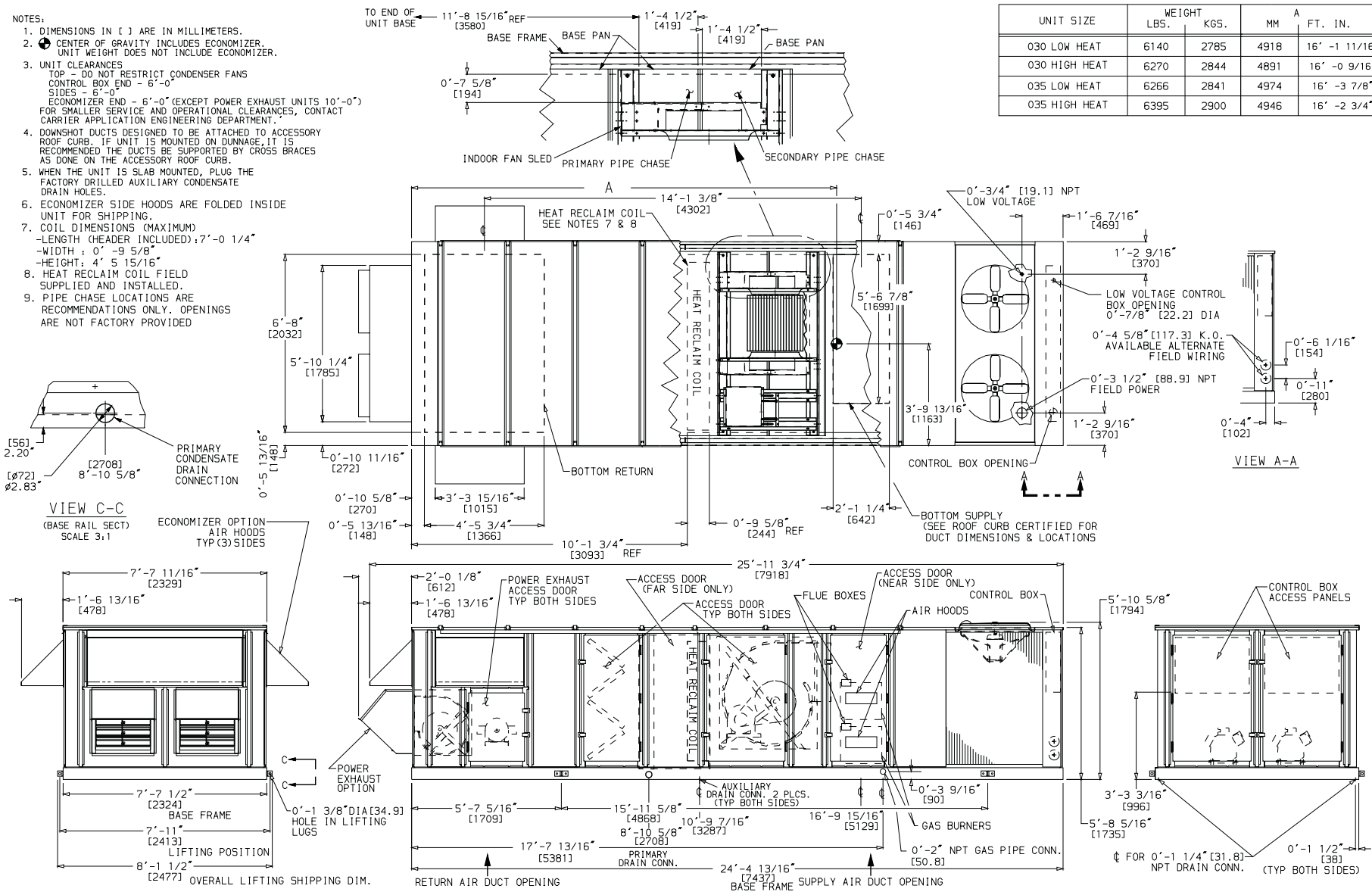


Fig. 19 — Base Unit Dimensional Drawing — 48ZA,ZE,ZJ030,035 (Extended Chassis)

NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. ⊕ CENTER OF GRAVITY INCLUDES ECONOMIZER. UNIT WEIGHT DOES NOT INCLUDE ECONOMIZER.
3. UNIT CLEARANCES
   TOP - DO NOT RESTRICT CONDENSER FANS
   CONTROL BOX END - 6'-0"
   SIDES - 6'-0"
   ECONOMIZER END - 6'-0" (EXCEPT POWER EXHAUST UNITS 10'-0")
   FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
4. DOWNSHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB. IF UNIT IS MOUNTED ON DUNNAGE, IT IS RECOMMENDED THE DUCTS BE SUPPORTED BY CROSS BRACES AS DONE ON THE ACCESSORY ROOF CURB.
5. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
6. ECONOMIZER SIDE HOODS ARE FOLDED INSIDE UNIT FOR SHIPPING.
7. COIL DIMENSIONS (MAXIMUM)
   -LENGTH (HEADER INCLUDED): 7'-0 1/4"
   -WIDTH : 0' -9 5/8"
   -HEIGHT: 4' 5 15/16"
8. HEAT RECLAIM COIL FIELD SUPPLIED AND INSTALLED.

UNIT SIZE	WEIGHT LBS.	WEIGHT KGS.	A MM	A FT. IN.
040 LOW HEAT	7040	3193	5677	18' -7 1/2"
040 HIGH HEAT	7170	3252	5650	18' -6 7/16"
050 LOW HEAT	7081	3211	5704	18' -8 5/8"
050 HIGH HEAT	7210	3270	5677	18' -7 1/2"

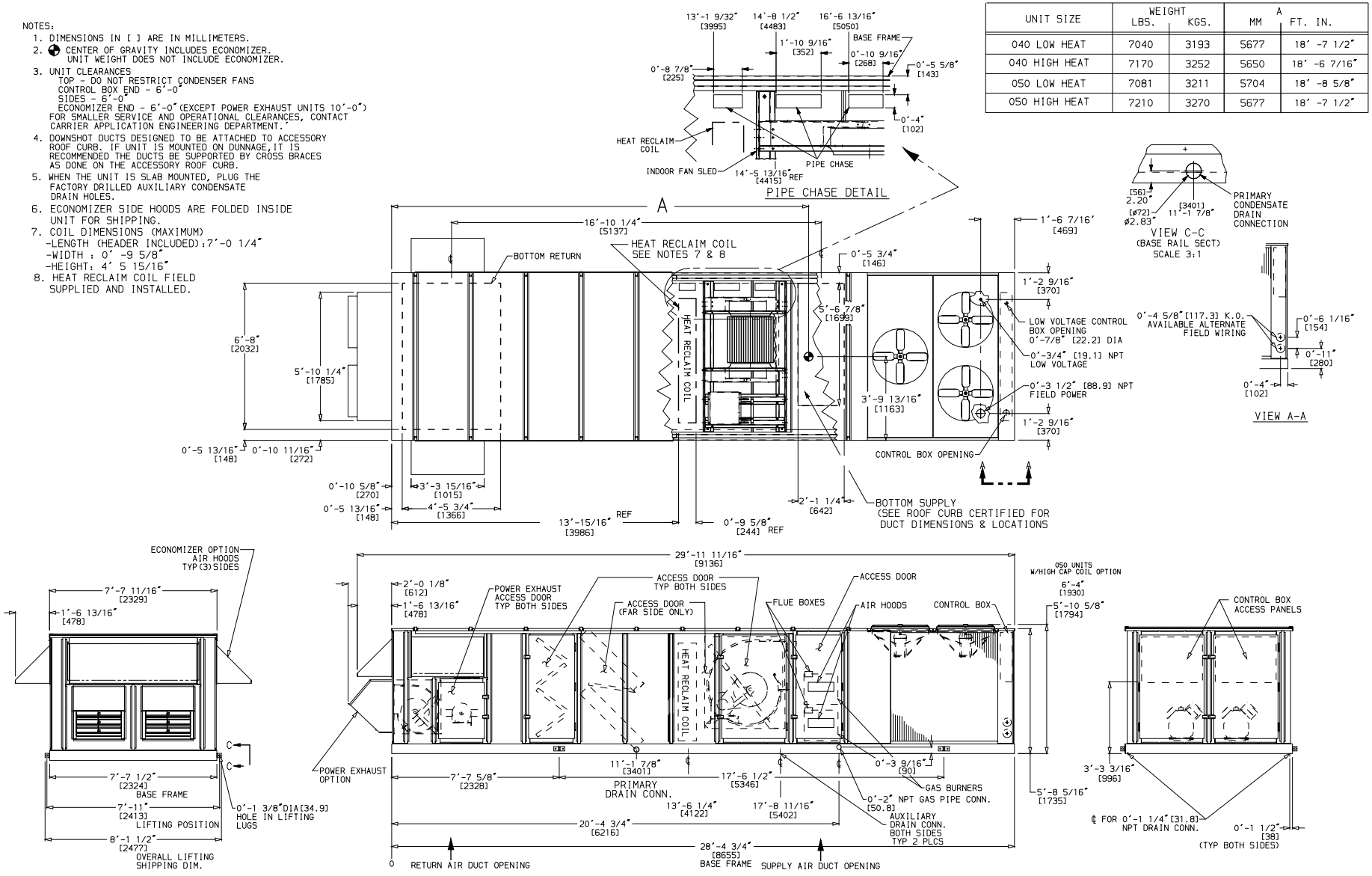


Fig. 20 — Base Unit Dimensional Drawing — 48ZA,ZE,ZJ040,050 (Extended Chassis)

UNIT SIZE	WEIGHT LBS.	WEIGHT KGS.	A MM	A FT. IN.	B MM	B FT. IN.	C MM	C FT. IN.	D MM	D FT. IN.	E MM	E FT. IN.	F MM	F FT. IN.
055 LOW HEAT	9248	4194	3728	12'-2 3/4"	6171	20'-2 15/16"	6312	20' -8 9/16"	1163	3'-9 25/32"	11780	38'-7 13/16"	12164	39'-10 7/8"
055 HIGH HEAT	9368	4278	3728	12'-2 3/4"	6171	20'-2 15/16"	6312	20' -8 9/16"	1163	3'-9 25/32"	11780	38'-7 13/16"	12164	39'-10 7/8"
060 LOW HEAT	9548	4330	3728	12'-2 3/4"	6171	20'-2 15/16"	6312	20' -8 9/16"	1163	3'-9 25/32"	11780	38'-7 13/16"	12164	39'-10 7/8"
060 HIGH HEAT	9668	4385	3728	12'-2 3/4"	6171	20'-2 15/16"	6312	20' -8 9/16"	1163	3'-9 25/32"	11780	38'-7 13/16"	12164	39'-10 7/8"

NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. ⊕ CENTER OF GRAVITY INCLUDES ECONOMIZER. UNIT WEIGHT DOES NOT INCLUDE ECONOMIZER.
3. UNIT CLEARANCES
   TOP - DO NOT RESTRICT CONDENSER FANS
   CONTROL BOX END - 6'-0"
   SIDES - 6'-0"
   ECONOMIZER END - 6'-0" (EXCEPT POWER EXHAUST UNITS 10'-0")
   FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
4. DOWNSHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB. IF UNIT IS MOUNTED ON DUNNAGE, IT IS RECOMMENDED THE DUCTS BE SUPPORTED BY CROSS BRACES AS DONE ON THE ACCESSORY ROOF CURB.
5. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
6. ECONOMIZER SIDE HOODS ARE FOLDED INSIDE UNIT FOR SHIPPING.
7. COIL DIMENSIONS (MAXIMUM)
   -LENGTH (HEADER INCLUDED): 7'-0 1/4"
   -WIDTH : 0' -9 5/8"
   -HEIGHT: 5' 6"
8. HEAT RECLAIM COIL FIELD SUPPLIED AND INSTALLED.

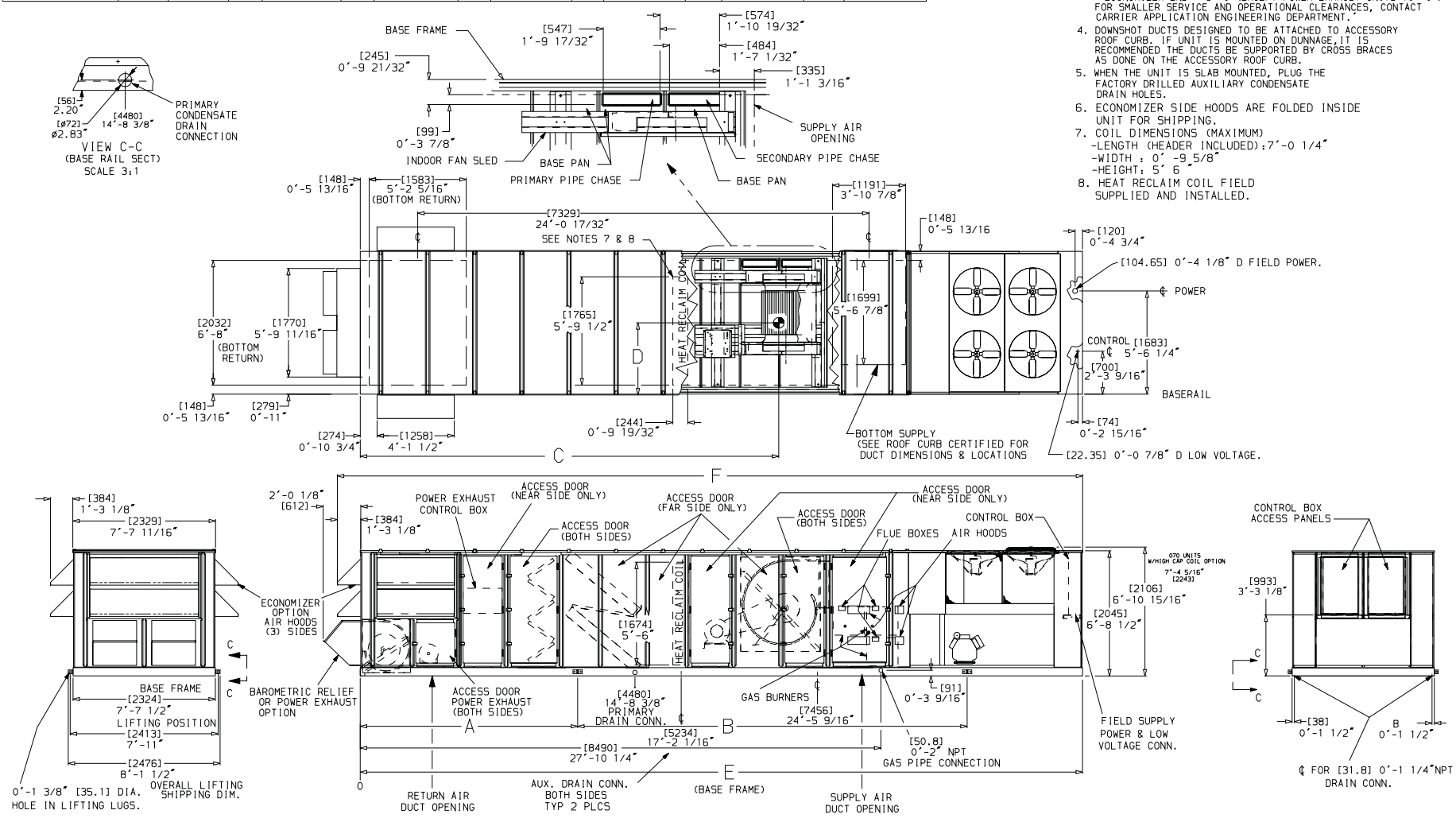


Fig. 21 — Base Unit Dimensional Drawing — 48ZA,ZE,ZJ055,060 (Extended Chassis)

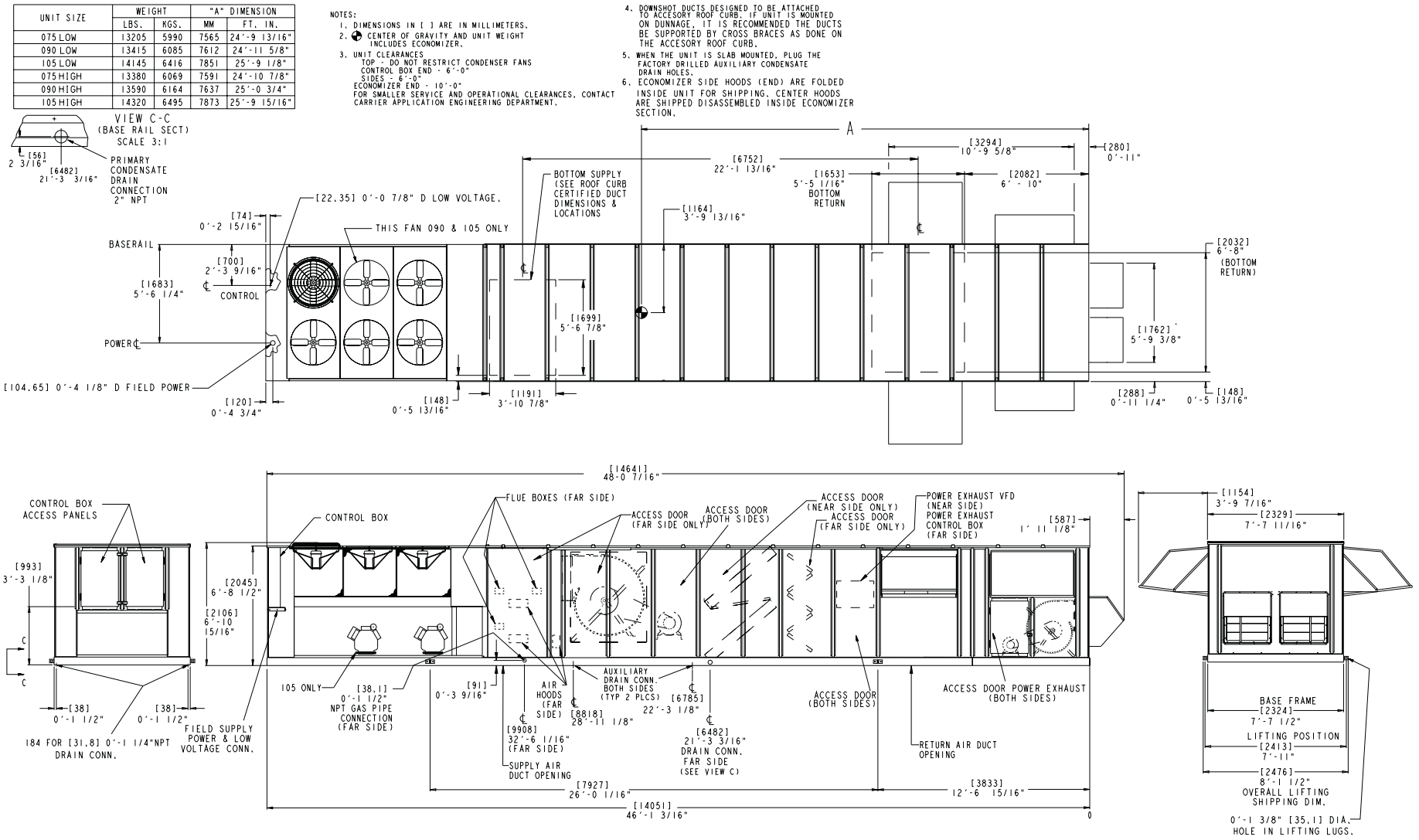

UNIT SIZE
WEIGHT
LBS. KGS.
"A" DIMENSION
MM FT. IN.
075 LOW 13205 5990 7565 24'-9 13/16"
090 LOW 13415 6085 7612 24'-11 5/8"
105 LOW 14145 6416 7851 25'-9 1/8"
075 HIGH 13380 6069 7591 24'-10 7/8"
090 HIGH 13590 6164 7637 25'-0 3/4"
105 HIGH 14320 6495 7873 25'-9 15/16"
NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. CENTER OF GRAVITY AND UNIT WEIGHT INCLUDES ECONOMIZER.
3. UNIT CLEARANCES
TOP - DO NOT RESTRICT CONDENSER FANS
CONTROL BOX END - 6'-0"
SIDES - 6'-0"
ECONOMIZER END - 10'-0"
FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
4. DOWNSHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESORY ROOF CURB. IF UNIT IS MOUNTED ON DUNNAGE, IT IS RECOMMENDED THE DUCTS BE SUPPORTED BY CROSS BRACES AS DONE ON THE ACCESORY ROOF CURB.
5. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
6. ECONOMIZER SIDE HOODS (END) ARE FOLDED INSIDE UNIT FOR SHIPPING. CENTER HOODS ARE SHIPPED DISASSEMBLED INSIDE ECONOMIZER SECTION.
VIEW C-C
(BASE RAIL SECT)
SCALE 3:1
[56] 2 3/16"
[6482] 21'-3 3/16"
PRIMARY CONDENSATE DRAIN CONNECTION 2" NPT
A
[3294] 10'-9 5/8"
[280] 0'-11"
[6752] 22'-1 13/16"
[1653] 5'-5 1/16" BOTTOM RETURN
[2082] 6' - 10"
BOTTOM SUPPLY (SEE ROOF CURB CERTIFIED DUCT DIMENSIONS & LOCATIONS
[1164] 3'-9 13/16"
[22.35] 0'-0 7/8" D LOW VOLTAGE.
THIS FAN 090 & 105 ONLY
[74] 0'-2 15/16"
BASERAIL
[700] 2'-3 9/16"
CONTROL
[1683] 5'-6 1/4"
POWER
[104.65] 0'-4 1/8" D FIELD POWER
[120] 0'-4 3/4"
[148] 0'-5 13/16"
[1191] 3'-10 7/8"
[1699] 5'-6 7/8"
[2032] 6'-8" (BOTTOM RETURN)
[1762] 5'-9 3/8"
[288] 0'-11 1/4"
[148] 0'-5 13/16"
[1464] 48'-0 7/16"
CONTROL BOX ACCESS PANELS
[993] 3'-3 1/8"
[2045] 6'-8 1/2"
[2106] 6'-10 15/16"
CONTROL BOX
FLUE BOXES (FAR SIDE)
ACCESS DOOR (FAR SIDE ONLY)
ACCESS DOOR (BOTH SIDES)
ACCESS DOOR (NEAR SIDE ONLY)
ACCESS DOOR (FAR SIDE ONLY)
POWER EXHAUST VFD (NEAR SIDE)
POWER EXHAUST CONTROL BOX (FAR SIDE)
[587] 1' 11 1/8"
[1154] 3'-9 7/16"
[2329] 7'-7 11/16"
105 ONLY
[38.1] 0'-1 1/2" NPT GAS PIPE CONNECTION (FAR SIDE)
[91] 0'-3 9/16"
AIR HOODS (FAR SIDE)
[8818] 28'-11 1/8"
AUXILIARY DRAIN CONN. BOTH SIDES (TYP 2 PLCS)
[6785] 22'-3 1/8"
[9908] 32'-6 1/16" (FAR SIDE)
SUPPLY AIR DUCT OPENING
[6482] 21'-3 3/16" DRAIN CONN. FAR SIDE (SEE VIEW C)
ACCESS DOOR (BOTH SIDES)
ACCESS DOOR POWER EXHAUST (BOTH SIDES)
RETURN AIR DUCT OPENING
[38] 0'-1 1/2"
[38] 0'-1 1/2"
184 FOR [31.8] 0'-1 1/4"NPT DRAIN CONN.
FIELD SUPPLY POWER & LOW VOLTAGE CONN.
[7927] 26'-0 1/16"
[3833] 12'-6 15/16"
[1405] 46'-1 3/16"
BASE FRAME [2324] 7'-7 1/2"
LIFTING POSITION [2413] 7'-11"
[2476] 8'-1 1/2" OVERALL LIFTING SHIPPING DIM.
0'-1 3/8" [35.1] DIA. HOLE IN LIFTING LUGS.

Fig. 22 — Base Unit Dimensional Drawing — 48ZT,ZV,ZW075-105 (Units with High Capacity Power Exhaust)

UNIT SIZE	WEIGHT		A		B		C		D		E		F	
	LBS.	KGS.	MM	FT. IN.	MM	FT. IN.	MM	FT. IN.	MM	FT. IN.	MM	FT. IN.	MM	FT. IN.
075 LOW HEAT	11740	5325	3544	11'-7 1/2"	6494	21' 3 5/8"	5893	19' 4"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
090 LOW HEAT	11950	5420	3544	11'-7 1/2"	6494	21' 3 5/8"	5944	19' 6"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
105 LOW HEAT	12680	5752	3544	11'-7 1/2"	6494	21' 3 5/8"	6147	20' 2"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
075 HIGH HEAT	11914	5742	3544	11'-7 1/2"	6494	21' 3 5/8"	5944	19' 6"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
090 HIGH HEAT	12124	5499	3544	11'-7 1/2"	6494	21' 3 5/8"	5969	19' 7"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
105 HIGH HEAT	12854	5831	3544	11'-7 1/2"	6494	21' 3 5/8"	6198	20' 4"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"

NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. ⊕ CENTER OF GRAVITY INCLUDES ECONOMIZER. UNIT WEIGHT DOES NOT INCLUDE ECONOMIZER.
3. UNIT CLEARANCES
   TOP - DO NOT RESTRICT CONDENSER FANS
   CONTROL BOX END - 6'-0"
   SIDES - 6'-0"
   ECONOMIZER END - 6'-0" (EXCEPT POWER EXHAUST UNITS 10'-0")
   FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
4. DOWNSHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB. IF UNIT IS MOUNTED ON DUNNAGE, IT IS RECOMMENDED THE DUCTS BE SUPPORTED BY CROSS BRACES AS DONE ON THE ACCESSORY ROOF CURB.
5. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
6. ECONOMIZER SIDE HOODS ARE FOLDED INSIDE UNIT FOR SHIPPING.

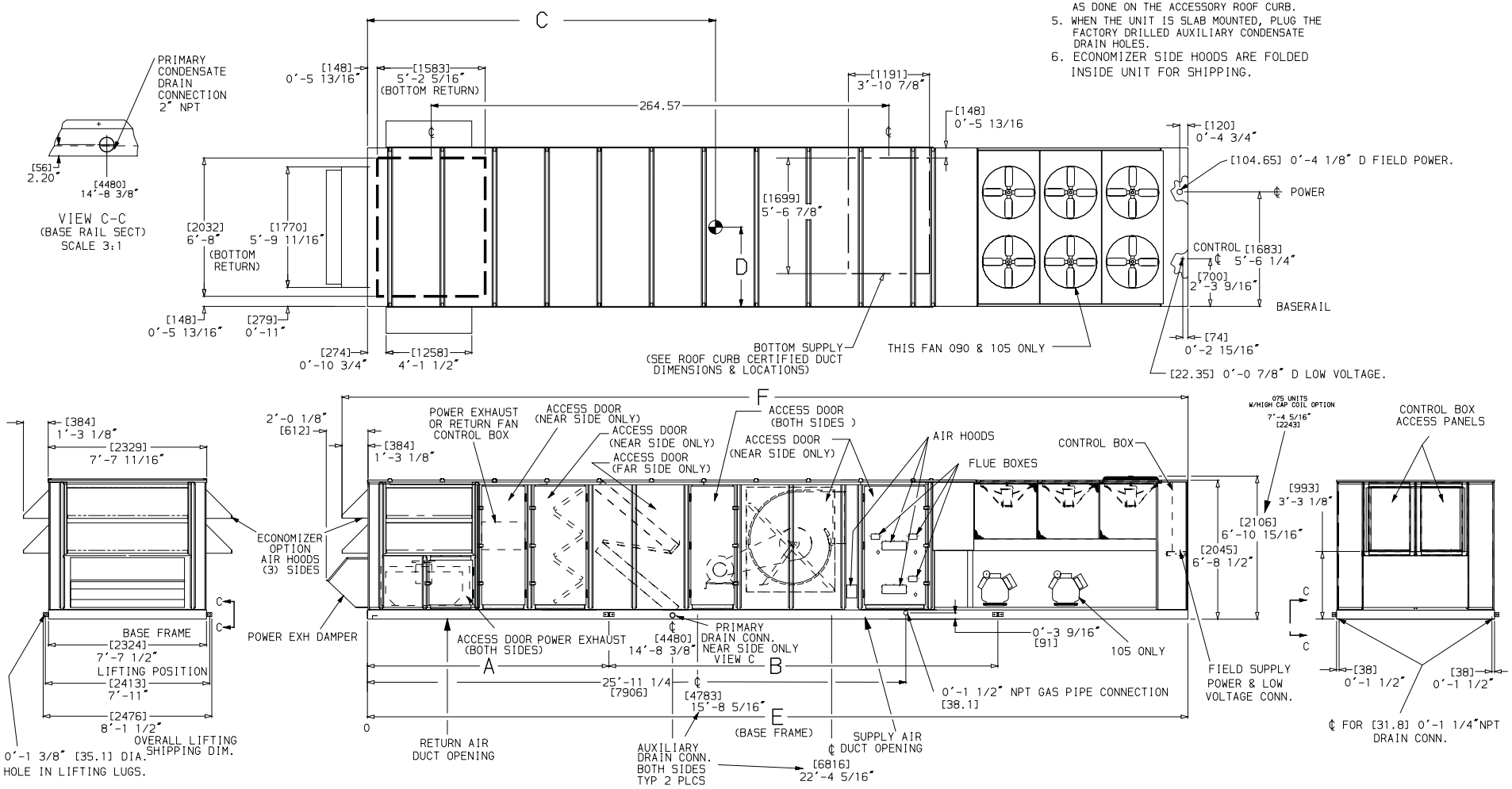


Fig. 23 — Base Unit Dimensional Drawing — 48ZC,ZL,ZR075-105 (Units with Return/Exhaust Fan)

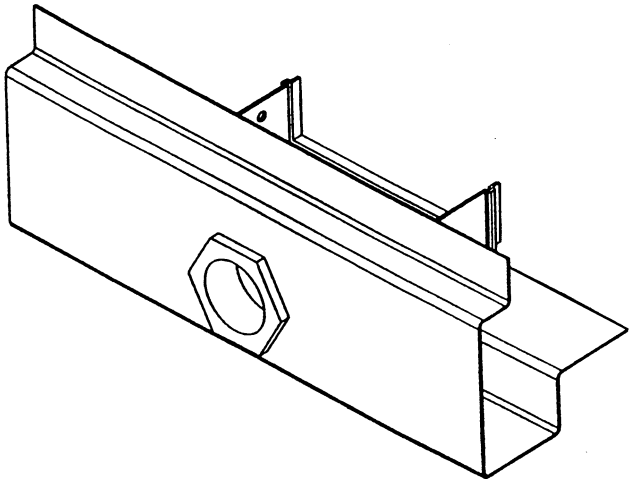
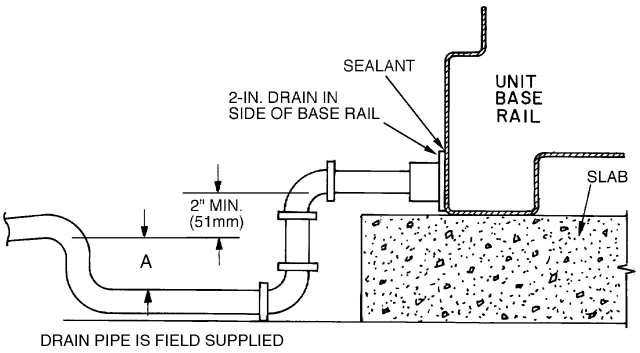
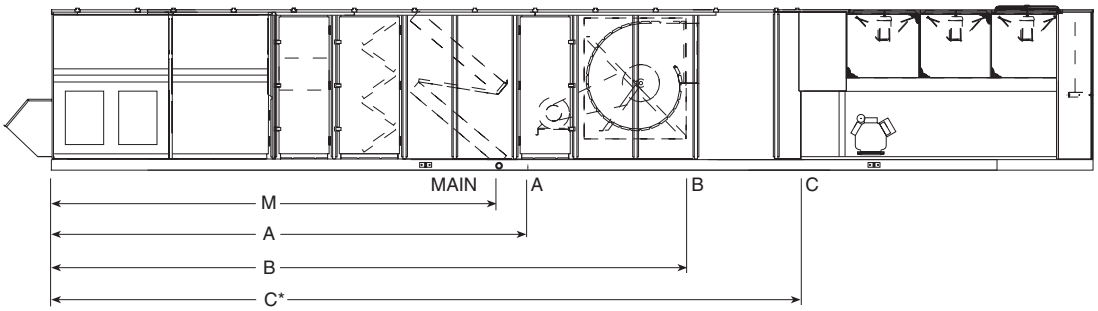


Fig. 24 — Primary Drain Connection



A = 4-in. (102 mm) min — 030-070
7-in. (178 mm) min — 075-105

Fig. 25 — Slab Mounted Condensate Drain Piping Details

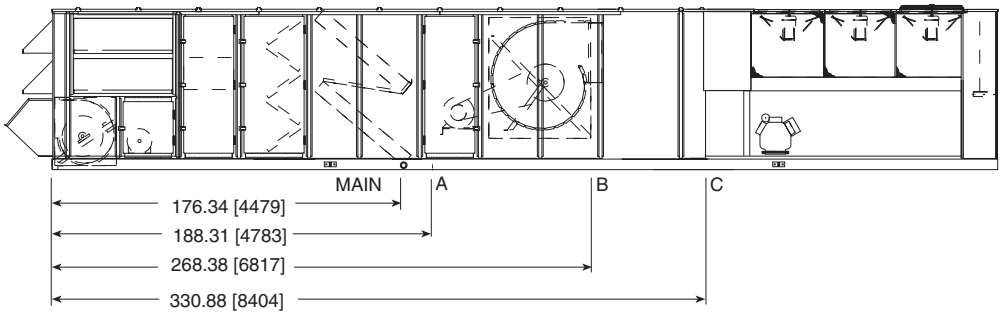


48ZA,ZE,ZJ030-070

STANDARD CHASSIS	PITCH		INCHES				MM			
			(M)	(A)	(B)	(C)	(M)	(A)	(B)	(C)
030, 035		Dimension	105.67	154.57	N/A	190.47	2684	3926	N/A	4838
	Return Air End High	Action	Pipe	Pipe	N/A	Open	Pipe	Pipe	N/A	Open
	Control Box End High	Action	Pipe	Pipe	N/A	Open	Pipe	Pipe	N/A	Open
040, 050		Dimension	133.90	148.39	187.48	226.89	3401	3769	4762	5763
	Return Air End High	Action	Pipe	Seal	Pipe	Open	Pipe	Seal	Pipe	Open
	Control Box End High	Action	Pipe	Pipe	Seal	Open	Pipe	Pipe	Seal	Open
055-070		Dimension	176.34	190.83	268.35	330.83	4479	4847	6816	8403
	Return Air End High	Action	Pipe	Seal	Pipe	Open	Pipe	Seal	Pipe	Open
	Control Box End High	Action	Pipe	Pipe	Seal	Open	Pipe	Pipe	Seal	Open
EXTENDED CHASSIS	**PITCH**		**INCHES**				**MM**			
			(M)	(A)	(B)	(C)	(M)	(A)	(B)	(C)
030, 035		Dimension	105.67	129.41	201.93	219.21	2684	3287	5129	5568
	Return Air End High	Action	Pipe	Seal	Pipe	Open	Pipe	Seal	Pipe	Open
	Control Box End High	Action	Pipe	Pipe	Seal	Open	Pipe	Pipe	Seal	Open
040, 050		Dimension	133.90	162.28	212.68	252.09	3401	4122	5402	6403
	Return Air End High	Action	Pipe	Seal	Pipe	Open	Pipe	Seal	Pipe	Open
	Control Box End High	Action	Pipe	Pipe	Seal	Open	Pipe	Pipe	Seal	Open
055-070		Dimension	176.34	206.06	293.54	356.02	4479	5234	7456	9043
	Return Air End High	Action	Pipe	Seal	Pipe	Open	Pipe	Seal	Pipe	Open
	Control Box End High	Action	Pipe	Pipe	Seal	Open	Pipe	Pipe	Seal	Open

*Drain location C: These drain locations (on both sides of the unit) permit drainage from the base rail sections of water that has entered the rail from under the condenser section. Do not seal or install traps at these locations.

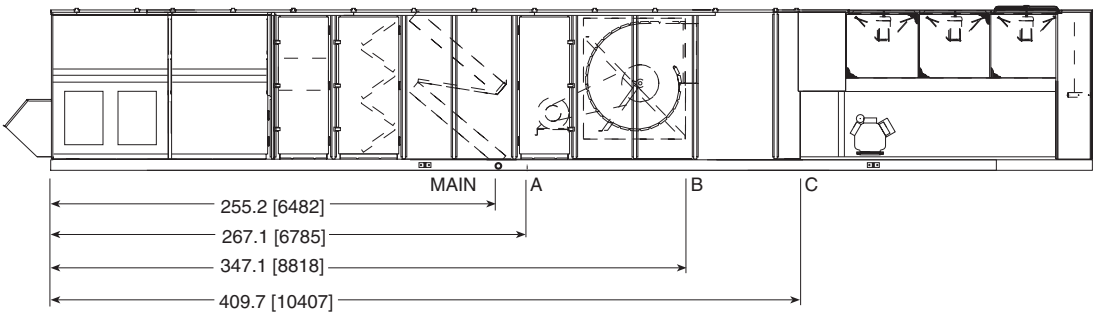
Fig. 26 — Condensate Drain Locations



48ZA,ZC,ZE,ZJ,ZL,ZR075-105

PITCH	DRAIN LOCATION		
	A	B	C*
Return Air End High	Seal	Pipe	Open
Control Box End High	Pipe	Seal	Open

*Drain location C: These drain locations (on both sides of the unit) permit drainage from the base rail sections of water that has entered the rail from under the condenser section. Do not seal or install traps at these locations.



48ZT,ZV,ZW075-105

PITCH	DRAIN LOCATION		
	A	B	C*
Return Air End High	Seal	Pipe	Open
Control Box End High	Pipe	Seal	Open

*Drain location C: These drain locations (on both sides of the unit) permit drainage from the base rail sections of water that has entered the rail from under the condenser section. Do not seal or install traps at these locations.

Fig. 26 — Condensate Drain Locations (cont)

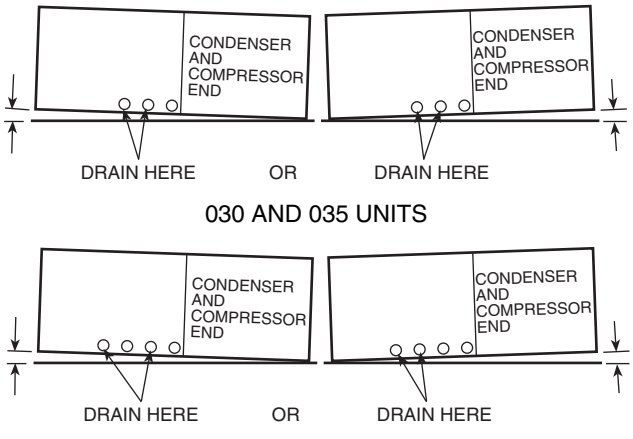


Fig. 27 — Typical Drain Location Selection

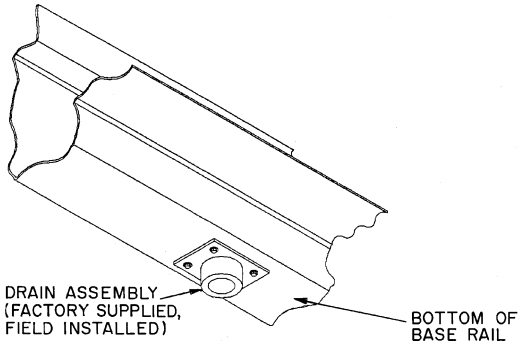


Fig. 28 — Secondary Condensate Drain Location

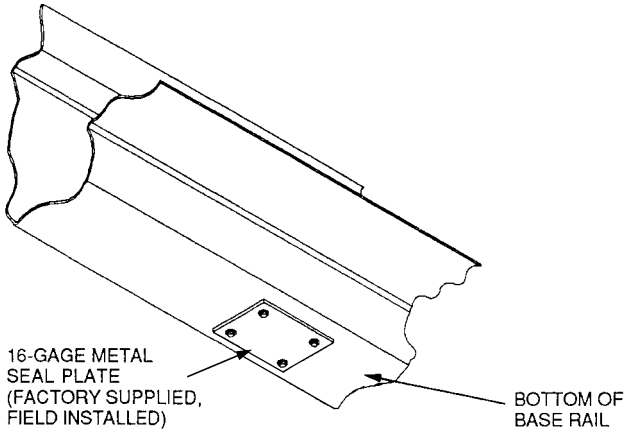
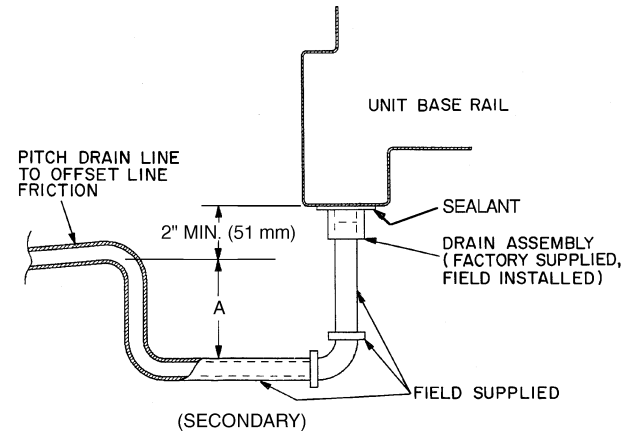


Fig. 29 — Secondary Drain Seal Plate Location



A = 4-in. (102 mm) min — sizes 030-070
7-in. (178 mm) min — sizes 075-105

Fig. 30 — Curb Mounted Condensate Drain Pipe Details

Install Outdoor Hoods (48ZA,ZC,ZE,ZJ,ZL,ZR Units)

UNIT SIZES 030-050

25% Outdoor-Air Hoods (Units Without Economizer Option) (Fig. 31)

1. Outdoor-air hoods are shipped bolted to the unit in a shipping position. Remove the 6 screws holding each 25% outdoor air hood shipping cover in place.
2. Remove the holddown screw from each upper corner of each hood.
3. Pivot hoods outward (2 hoods).
4. Install 17 screws around outside of each hood. (Screws are in the fastener package taped to the basepan inside the fan section.)
5. Apply a bead of RTV or similar sealant to corner of each hood at pivot point to prevent water leaks. See Fig. 32.

Economizer Hoods (Units With Economizer Option) (Fig. 33 and 34) — Follow the same procedure described in 25% Outdoor-Air Hoods section above.

UNIT SIZES 055-105

25% Outdoor-Air Hoods (Fig. 35) — The outdoor-air hoods are factory installed on the 055-105 units.

Economizer Hoods (Units With Economizer Option) (Fig. 36-38)

1. Remove the 6 screws holding each of the 4 economizer shipping covers in place.
2. Remove the holddown screw from each upper corner of each economizer hood.
3. Pivot hoods outward (4 hoods).
4. Install 18 screws (5 each side, 6 top, and 2 bottom) around the outside of each hood. (Screws are in the fastener package taped to the basepan inside the fan section.)
5. Apply a bead of RTV or similar sealant to corner of economizer hood at pivot point to prevent water leaks. (See Fig. 32.)

Install Economizer Hoods (48ZT,ZV,ZW Units) —

The economizer uses a total of 4 outdoor intake hoods, 2 on each side of the unit. See Fig. 39. Two small hoods (one per side) are factory-installed and are pivoted inside the unit chassis for shipment. Two large hoods are shipped in packages located inside the unit. The large hoods (1 on each side) require field assembly and mounting.

INSTALL SMALL HOODS — To install the small economizer hoods, perform the following procedure:

1. Remove the 10 screws holding each of the small economizer hood shipping covers in place.
2. Pivot hoods outward. (There are a total of 2 hoods.)
3. Install 15 screws (4 each side, 7 across top) around the outside of each hood. Screws are in the fastener package taped to the basepan inside the fan section.
4. Apply a bead of RTV or similar sealant to corner of economizer hood at pivot point to prevent water leaks. (See Fig. 32.)

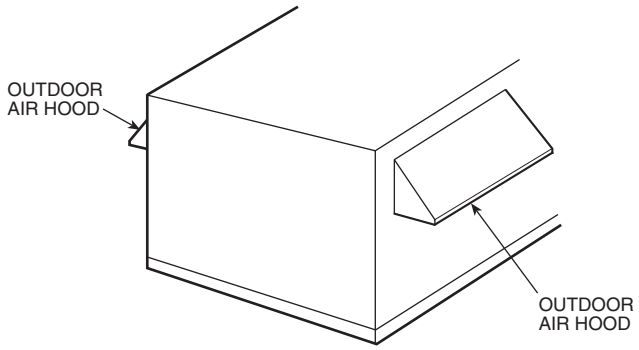


Fig. 31 — Outdoor Air Hood Installation (Sizes 030-050)

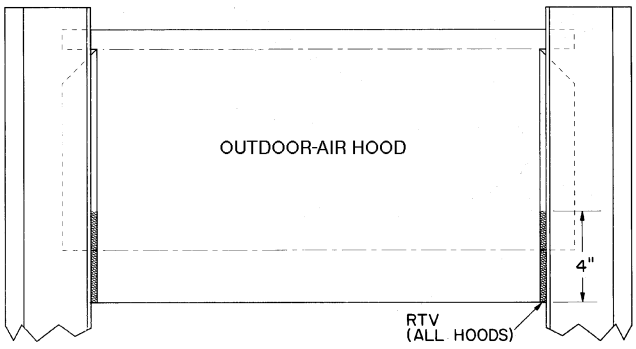


Fig. 32 — Outdoor-Air and Economizer Hood

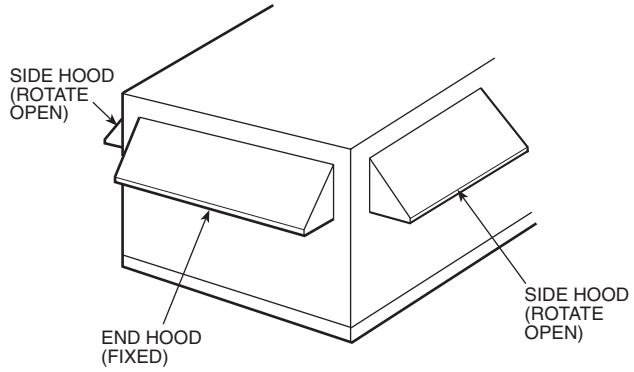


Fig. 33 — Economizer Outdoor-Air Hood Installation (Sizes 030-050)

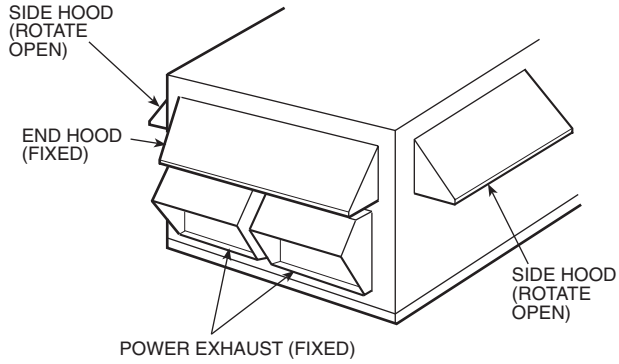


Fig. 34 — Economizer with Power Exhaust Outdoor-Air Hood Installation (Sizes 030-050)

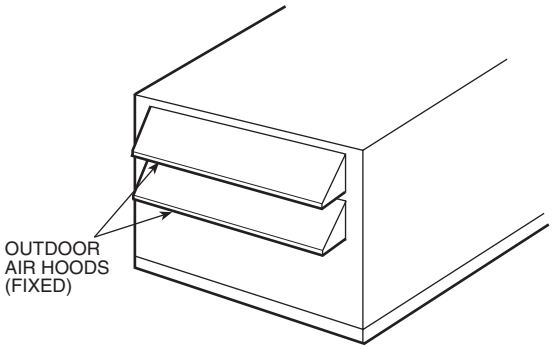


Fig. 35 — 25% Outdoor-Air Hood Location (Sizes 055-105)

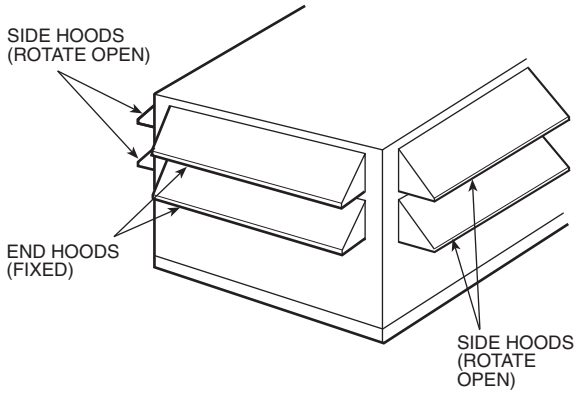


Fig. 36 — Economizer Outdoor-Air Hood Installation (Sizes 055-105)

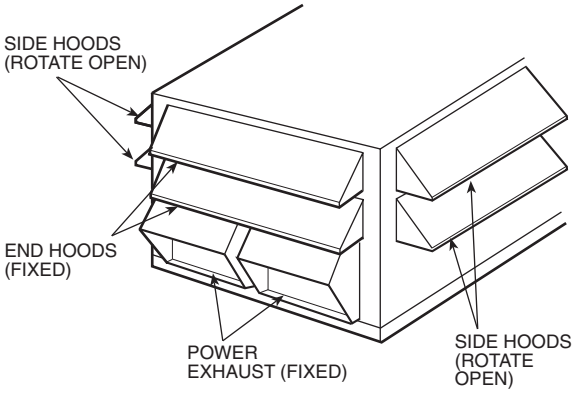


Fig. 37 — Economizer with Power Exhaust Outdoor-Air Hood Installation (Sizes 055-105)

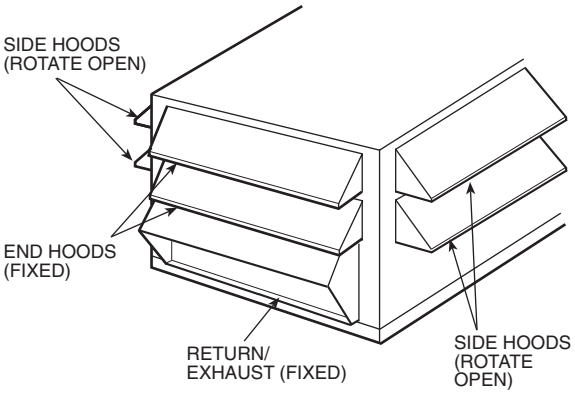
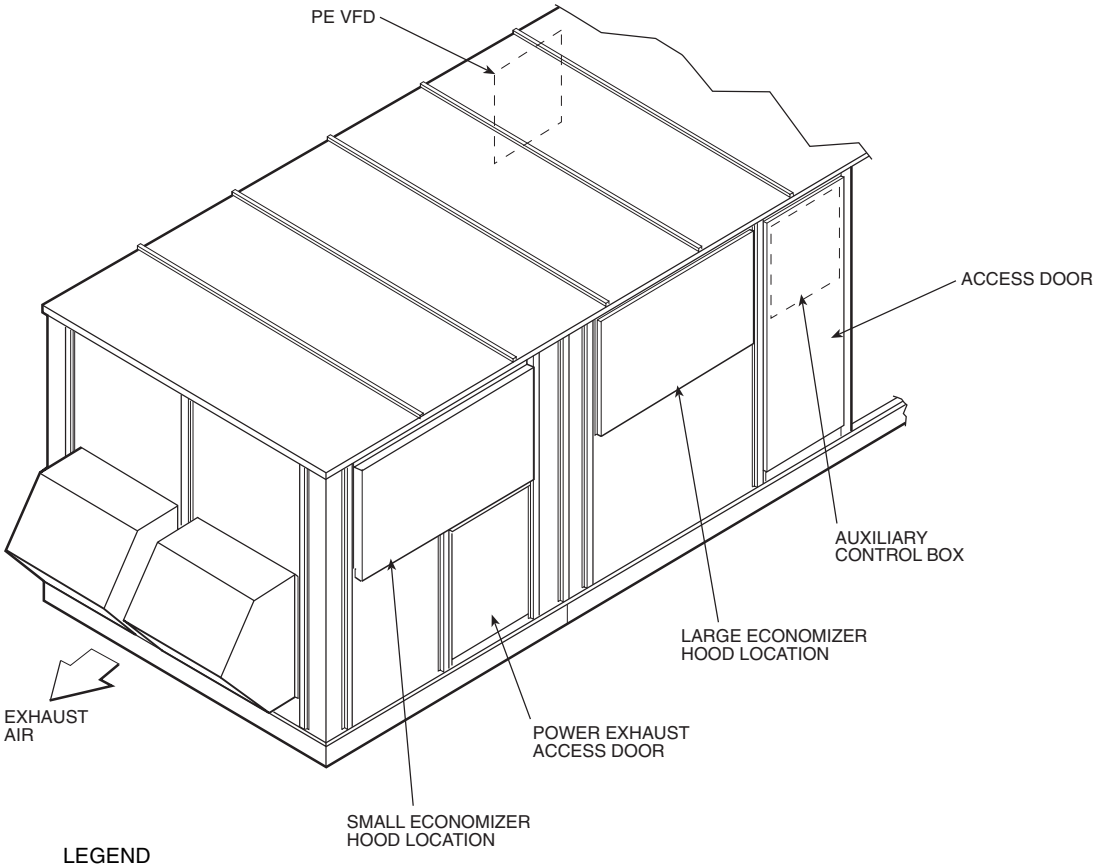


Fig. 38 — Economizer with Return/Exhaust Fan Outdoor-Air Hood Installation (48ZC,ZL,ZR075-105 Units)

INSTALL LARGE HOODS — Large hoods are shipped disassembled in the economizer section of the unit behind the large economizer hood shipping cover. See Fig. 40 for assembly details for large economizer hoods. To install the large economizer hoods, perform the following procedure:

1. Remove the 17 screws holding each of the large economizer hood shipping covers in place.
2. Remove the packages containing the disassembled large economizer hoods (total of 2 packages). Each package contains the following: left side hood, right side hood, top hood, front hood, top filter flange, side filter flanges (4), bottom support, front support, filters (6), filter clips (9), seal strip, fasteners.
3. Place seal strip on backside of bottom support along entire length of support, covering 6 clearance holes.
4. Attach bottom support piece to unit. Be sure seal strip is between bottom support and panel on unit.
5. Place seal strip on $^3/_4$-in. flange on both the left and right side hood.
6. Attach the side filter flanges to the left and right side hoods, 2 on each side hood.
7. Attach left and right side hoods to unit. Be sure seal strip is between side hood and unit.
8. Place seal strip on $^3/_4$-in. flange on top hood.
9. Attach top filter flange to top hood.
10. Attach top hood to unit and to side hoods. Be sure seal strip is between top hood and unit.
11. Attach front support between left and right side hoods.
12. Place seal strip on all filter flanges.
13. Attach filter clips to front and bottom supports.
14. Install filters and filter clips. Filters are held in place with filter clips.
15. Attach front hood to top and side hoods.
16. Apply RTV to 6 places shown in Fig. 40.



LEGEND

PE VFD — Power Exhaust Variable Frequency Drive

Fig. 39 — Economizer Hood Location — 48ZT,ZV,ZW

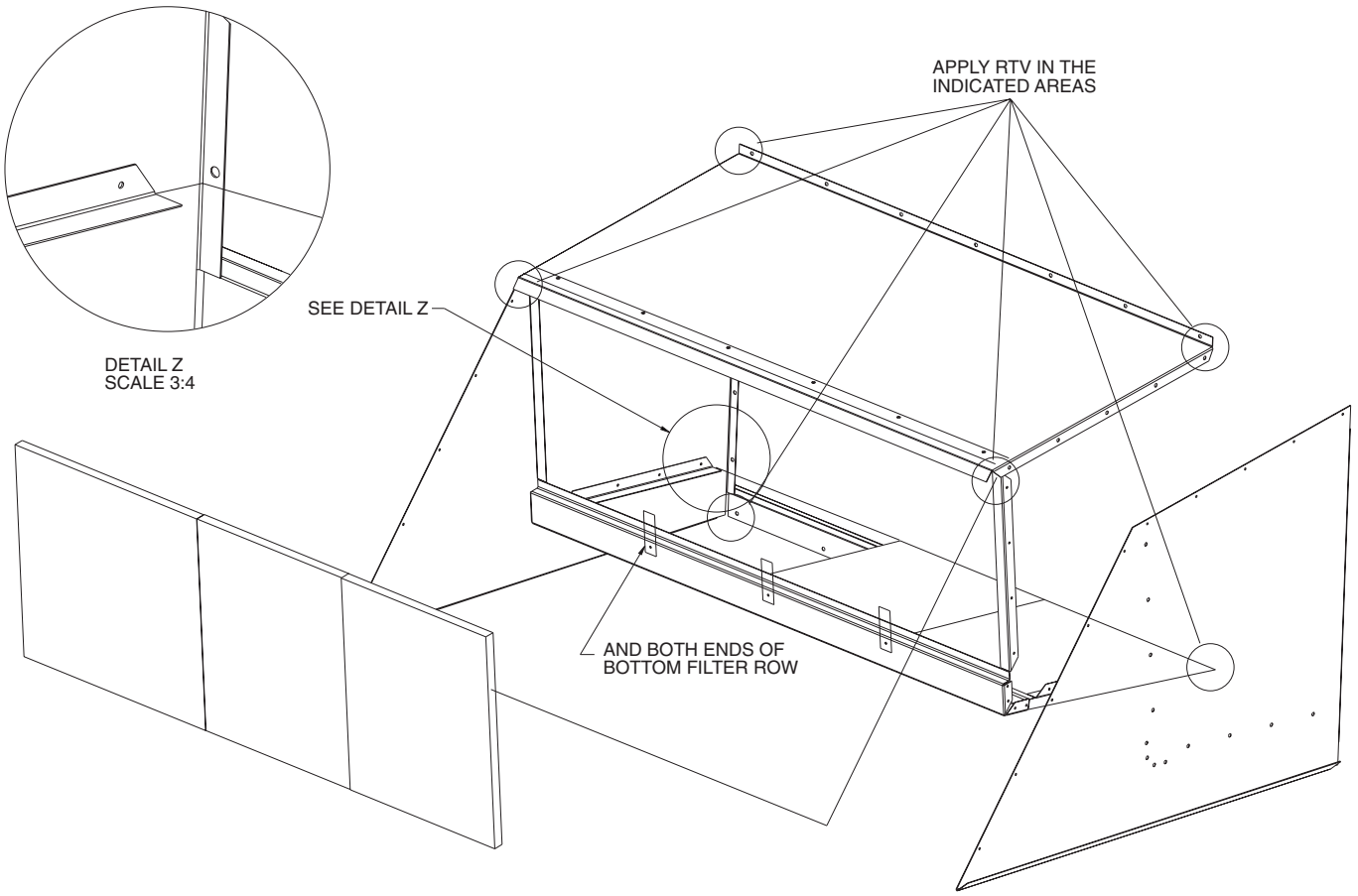


Fig. 40 — Large Economizer Hood Assembly

Field Wire Routing

UNIT SIZES 030-050 — Field wiring can be brought into the unit through the basepan and roof curb or through the corner post in the side of the unit next to the control box.

A $3^{1}/_{2}$-in. NPT coupling for field power and a $^{3}/_{4}$-in. NPT coupling for 24 v control wiring are provided in the basepan. There are two $4^{5}/_{8}$-in. knockouts in the corner post for field power wiring.

If field power wiring is brought through the roof curb, route wiring out through one of the $4^{5}/_{8}$-in. knockouts to the field-supplied disconnect and then back into the unit through the other knockout. See Fig. 41 for recommended disconnect location.

If power wiring is brought through the side of the unit, route wiring from field-supplied disconnect through top $4^{5}/_{8}$-in. knockouts into unit.

If control wiring is to be brought in through the side of the unit, a $^{7}/_{8}$-in. diameter hole must be drilled in the corner post next to the control box.

UNIT SIZES 055-105 — Field wiring is brought into the unit through the bottom of the control box. Wiring can be brought through the roof curb through field-supplied watertight connections. See Fig. 42 and 43.

A $4^{5}/_{32}$-in. hole for field power wiring and a $^{7}/_{8}$-in. hole for 24 v control wiring are provided in the bottom of the control box. Field-supplied couplings must be used when routing wiring into the control box.

See Fig. 42 and 43 for recommended disconnect location.

Field Electrical Connections

IMPORTANT: The 48ZE,ZJ,ZL,ZR units generate, use, and can radiate radio frequency energy. If units are not installed and used in accordance with these instructions, they may cause radio interference. They have been tested and found to comply with limits of a Class A computing device as defined by FCC (Federal Communications Commission) regulations, Subpart J of Part 15, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

POWER WIRING — Units are factory wired for the voltage shown on the unit nameplate. The main terminal block is suitable for use with aluminum or copper wires. Maximum wire size varies according to disconnect size.

Units Without Factory-Installed Disconnect — When installing units, provide a disconnect per NEC (National Electrical Code) of adequate size (MOCP [Maximum Overcurrent Protection] of unit is on the informative plate). All field wiring must comply with NEC and all local codes. Size wire based on MCA (Minimum Circuit Amps) on the unit informative plate. See Fig. 44 for power wiring connections to the unit power terminal block and equipment ground. Maximum wire size is (2) 500 MCM conductors per pole.

Units with Factory-Installed Disconnect — The factory-installed disconnect is an interlocking, door-type. The disconnect handle locks the door when it is in the ON position. The disconnect handle must be in the OFF position to open the control box door. The disconnect is located in a separate control box behind the control box door for size 030-050 units. See Fig. 45. The disconnect is located inside the main control box for size 055-105 units. See Fig. 46.

All field wiring must comply with NEC and all local codes. Wire must be sized based on MCA (Minimum Circuit Amps) on the unit informative plate. See Fig. 47 for power wiring connections to the unit disconnect and equipment ground.

DISCONNECT SIZE	MAXIMUM WIRE SIZE (MCM)
200 Amps	(1) 300
400 Amps	(1) 600
600 Amps	(2) 600

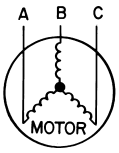
Operating Voltage — Operating voltage to the compressor must be within the voltage range indicated on the unit nameplate. Voltages between phases must be balanced within 2%, and the current must be balanced within 10%. See Tables 7-16 for unit electrical data.

Use the following formula to determine the percentage of voltage imbalance.

Voltage Imbalance

$$= 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

Example: Supply voltage is 460-3-60.



AB = 452 v
BC = 464 v
AC = 455 v

$$\text{Average Voltage} = \frac{455 + 464 + 455}{3}$$

$$= \frac{1371}{3}$$

$$= 457$$

Determine maximum deviation from average voltage:

(AB) 457 – 452 = 5 v
(BC) 464 – 457 = 7 v
(AC) 457 – 455 = 2 v

Maximum deviation is 7 v.

Determine percent voltage imbalance:

$$\% \text{ Voltage Imbalance} = 100 \times \frac{7}{457}$$

$$= 1.53\%$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

IMPORTANT: If the supply voltage phase imbalance is more than 2%, contact local utility immediately.

Unit failure as a result of operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components.

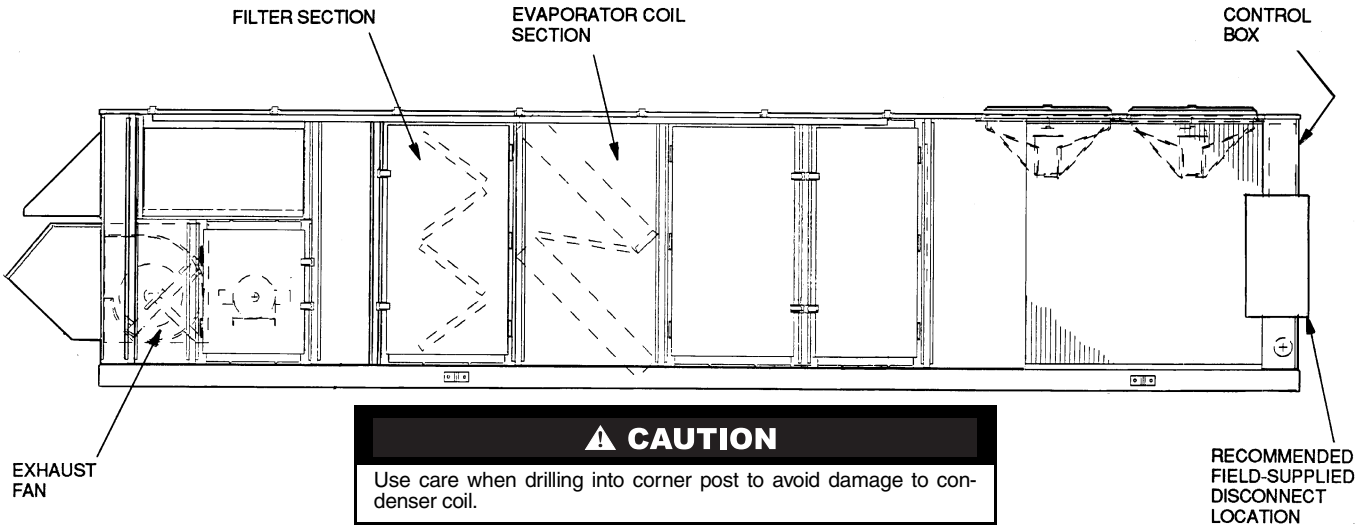
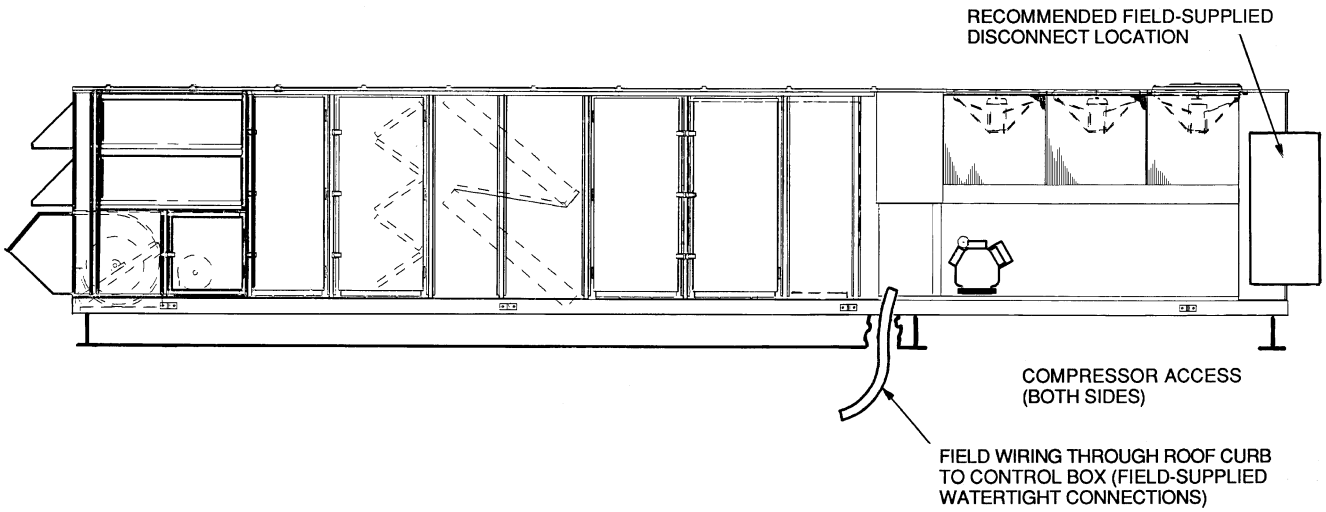

FILTER SECTION
EVAPORATOR COIL SECTION
CONTROL BOX
EXHAUST FAN
RECOMMENDED FIELD-SUPPLIED DISCONNECT LOCATION
⚠ CAUTION
Use care when drilling into corner post to avoid damage to condenser coil.

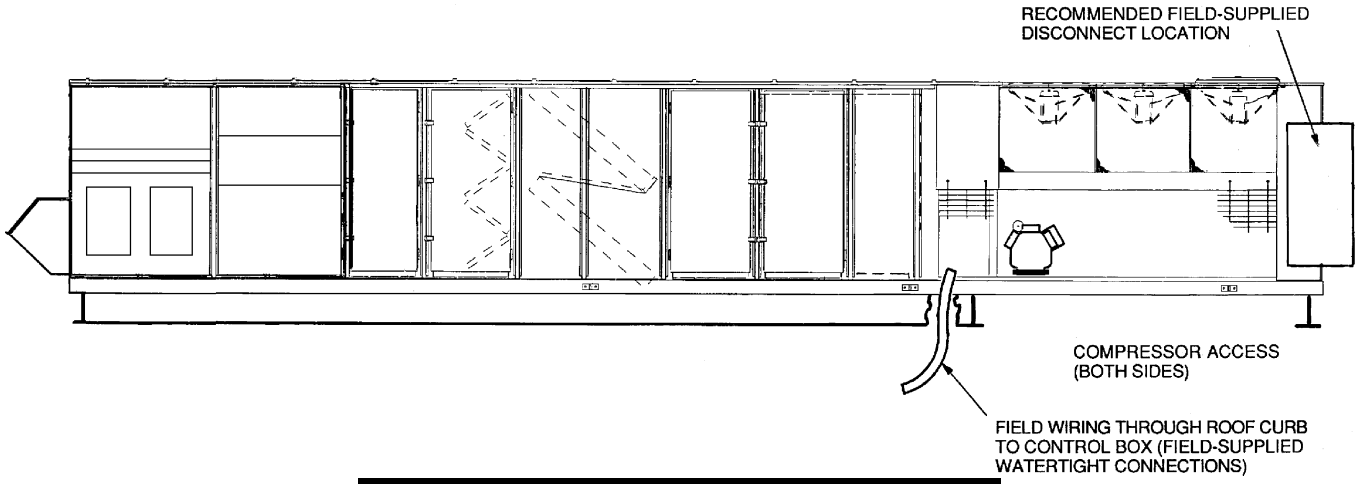
Fig. 41 — Disconnect Location — Size 030-050 Units



⚠ CAUTION

Use care when drilling into corner post to avoid damage to condenser coil.

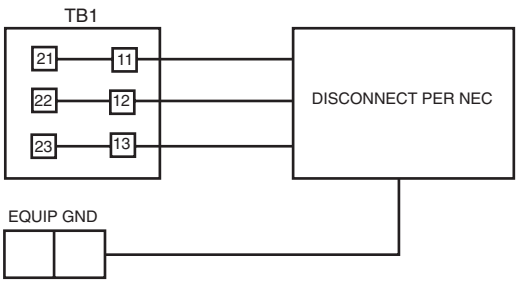
Fig. 42 — Disconnect Location — 48ZA,ZE,ZJ055-105 and 48ZC,ZL,ZR075-105 Units



⚠ CAUTION

Use care when drilling into corner post to avoid damage to condenser coil.

Fig. 43 — Disconnect Location — 48ZT,ZV,ZW075-105 Units



LEGEND

EQUIP — Equipment
GND — Ground
NEC — National Electrical Code
TB — Terminal Block

Fig. 44 — Field Power Wiring Connections

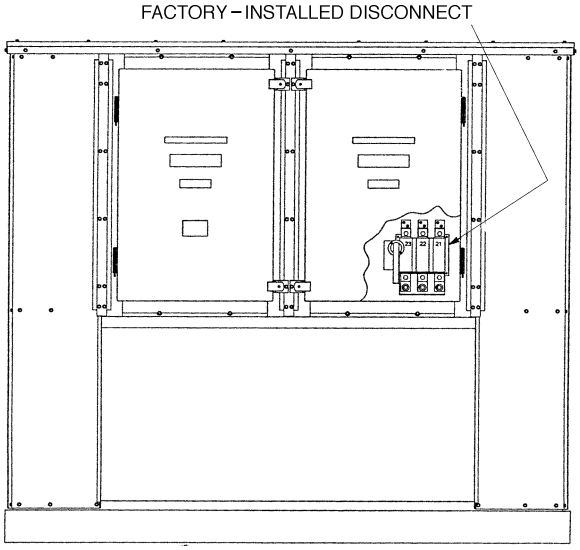


Fig. 46 — Factory-Installed Disconnect Location (Sizes 055-105)

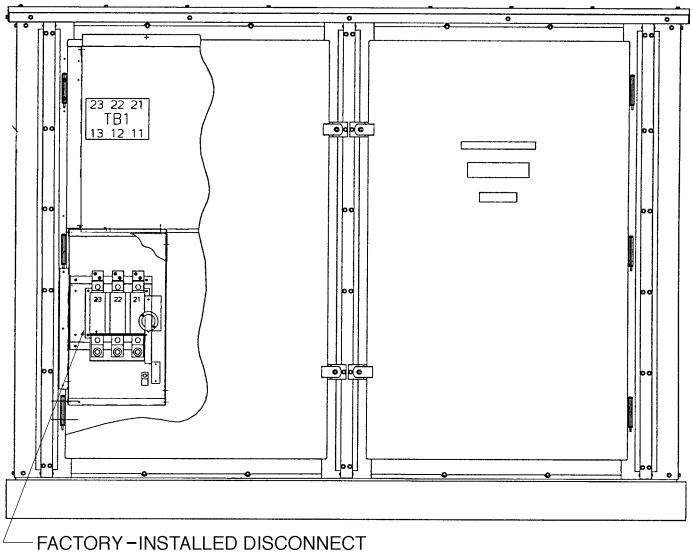


Fig. 45 — Factory-Installed Disconnect Location (Sizes 030-050)

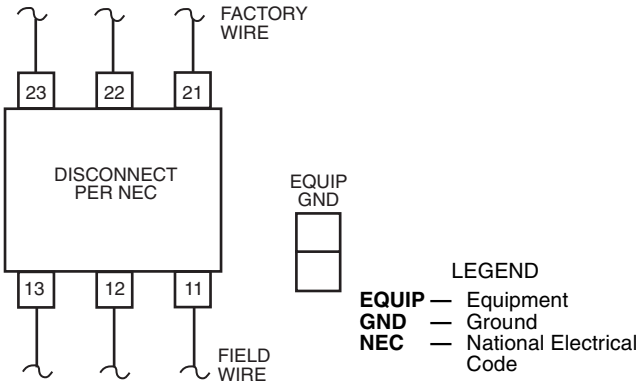


Fig. 47 — Field Power Wiring Connections for Factory-Installed Disconnect

Table 7 — Electrical Data, 48ZA,ZE,ZJ030 Units

NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE	COMPR NO. 1		COMPR NO. 2		OFM	IFM		BASE UNIT ONLY		EXHAUST FAN		BASE UNIT WITH EXHAUST FAN	
		RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	MCA	MOCP	Total Hp	Total FLA	MCA	MOCP
208/230	187-254	53.2	266	53.2	266	13.2	7.5	24.2/22	157.1/154.9	200/200	6 10 15	22/20 34/30 48/44	178.3/174.9 190.5/184.9 205.5/198.9	225/225 225/225 250/250
							10	30.8/28	163.7/160.9	200/200	6 10 15	22/20 34/30 48/44	184.9/180.9 197.1/190.9 212.1/204.9	225/225 250/225 250/250
							15	46.2/42	179.1/174.9	225/225	6 10 15	22/20 34/30 48/44	200.3/194.9 212.5/204.9 227.5/218.9	250/225 250/250 275/250
							20	59.4/54	192.3/186.9	225/225	6 10 15	22/20 34/30 48/44	213.5/206.9 225.7/216.9 240.7/230.9	250/250 275/250 275/275
							25	74.8/68.0	213.1/204.6	250/250	6 10 15	22/20 34/30 48/44	234.3/223.8 246.5/235.0 261.5/248.6	300/250 300/300 300/300
460	414-508	28.8	120	28.8	120	6.6	7.5	11.0	82.4	110	6 10 15	9.6 15.2 22.0	92.0 97.6 104.4	110 125 125
							10	14.0	85.4	110	6 10 15	9.6 15.2 22.0	95.0 100.6 107.4	110 125 125
							15	21.0	92.4	110	6 10 15	9.6 15.2 22.0	102.0 107.6 114.4	125 125 125
							20	27.0	98.4	125	6 10 15	9.6 15.2 22.0	108.0 113.6 120.4	125 125 125
							25	34.0	106.7	125	6 10 15	9.6 15.2 22.0	116.3 121.9 128.7	150 150 150
575	518-632	23.1	96	23.1	96	4.8	7.5	9.0	65.8	80	6 10 15	7.8 12.2 18.0	73.6 78.0 83.8	90 100 100
							10	11.0	67.8	90	6 10 15	7.8 12.2 18.0	75.6 80.0 85.8	90 100 100
							15	17.0	73.8	90	6 10 15	7.8 12.2 18.0	81.6 86.0 91.8	100 100 110
							20	22.0	78.8	90	6 10 15	7.8 12.2 18.0	86.6 91.0 96.8	100 110 110
							25	27.0	84.8	110	6 10 15	7.8 12.2 18.0	92.6 97.0 102.8	110 110 125

LEGEND

FLA — Full Load Amps
Hp — Nominal Horsepower
IFM — Indoor (Supply) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing)
MOCP — Maximum Overcurrent Protection
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

NOTE: Units use 1 (low heat) or 2 (high heat) combustion fan motors rated at 0.3 FLA each.

Table 8 — Electrical Data, 48ZA,ZE,ZJ035 Units

NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE	COMPR NO. 1		COMPR NO. 2		OFM	IFM		BASE UNIT ONLY		EXHAUST FAN		BASE UNIT WITH EXHAUST FAN	
		RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	MCA	MOCP	Total Hp	Total FLA	MCA	MOCP
208/230	187-254	53.2	266	69.2	345	13.2	7.5	24.2/22.0	177.1/174.9	225/225	6 10 15	21.2/20.0 33.4/30.0 48.4/44.0	198.3/194.1 210.5/205.3 225.5/218.9	250/250 250/250 250/250
							10	30.8/28.0	183.7/180.9	250/250	6 10 15	21.2/20.0 33.4/30.0 48.4/44.0	204.9/200.1 217.1/211.3 232.1/224.9	250/250 250/250 300/250
							15	46.2/42.0	199.1/194.9	250/250	6 10 15	21.2/20.0 33.4/30.0 48.4/44.0	220.3/214.1 232.5/225.3 247.5/238.9	250/250 300/250 300/300
							20	59.4/54.0	212.3/206.9	250/250	6 10 15	21.2/20.0 33.4/30.0 48.4/44.0	233.5/226.1 245.7/237.3 260.7/250.9	300/250 300/300 300/300
							25	74.8/68.0	229.1/220.9	300/250	6 10 15	22.0/20.0 34.0/30.0 48.0/44.0	250.3/240.1 262.5/251.3 277.5/264.9	300/300 300/300 350/300
460	414-508	28.8	120	34.6	173	6.6	7.5	11.0	89.7	110	6 10 15	9.6 15.2 22.0	99.3 104.9 111.7	125 125 125
							10	14.0	92.7	125	6 10 15	9.6 15.2 22.0	102.3 107.9 114.7	125 125 125
							15	21.0	99.7	125	6 10 15	9.6 15.2 22.0	109.3 114.9 121.7	125 125 150
							20	27.0	105.7	125	6 10 15	9.6 15.2 22.0	115.3 120.9 127.7	125 150 150
							25	34.0	112.7	125	6 10 15	9.6 15.2 22.0	122.3 127.9 134.7	150 150 150
575	518-632	23.1	96	26.7	120	4.8	7.5	9.0	70.3	90	6 10 15	7.8 12.2 18.0	78.1 82.5 88.3	100 100 110
							10	11.0	72.3	90	6 10 15	7.8 12.2 18.0	80.1 84.5 90.3	100 110 110
							15	17.0	78.3	100	6 10 15	7.8 12.2 18.0	86.1 90.5 96.3	110 110 110
							20	22.0	83.3	100	6 10 15	7.8 12.2 18.0	91.1 95.5 101.3	110 110 125
							25	27.0	88.4	110	6 10 15	7.8 12.2 18.0	96.2 100.6 106.4	110 125 125

LEGEND

FLA — Full Load Amps
Hp — Nominal Horsepower
IFM — Indoor (Supply) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing)
MOCP — Maximum Overcurrent Protection
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

NOTE: Units use 1 (low heat) or 2 (high heat) combustion fan motors rated at 0.3 FLA each.

Table 9 — Electrical Data, 48ZA,ZE,ZJ040 Units

NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE	COMPR NO. 1		COMPR NO. 2		OFM	IFM		BASE UNIT ONLY		EXHAUST FAN		BASE UNIT WITH EXHAUST FAN	
		RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	MCA	MOCP	Total Hp	Total FLA	MCA	MOCP
208/230	187-254	69.2	345	69.2	345	19.8	7.5	24.2/22	199.7/197.5	250/250	6 10 15	22/20 34/30 48/44	220.9/217.5 233.1/227.5 248.1/241.5	275/275 300/275 300/300
							10	30.8/28	206.3/203.5	275/250	6 10 15	22/20 34/30 48/44	227.5/223.5 239.7/233.5 254.7/247.5	275/275 300/300 300/300
							15	46.2/42	221.7/217.5	275/275	6 10 15	22/20 34/30 48/44	242.9/237.5 255.1/247.5 270.1/261.5	300/300 300/300 300/300
							20	59.4/54	234.9/229.5	300/275	6 10 15	22/20 34/30 48/44	256.1/249.5 268.3/259.5 283.3/273.5	300/300 300/300 350/300
							25	74.8/68	251.7/243.5	300/300	6 10 15	22/20 34/30 48/44	272.9/262.7 285.1/273.9 300.1/287.5	300/300 350/300 350/350
							30	88.0/80	268.2/258.2	350/300	6 10 15	22/20 34/30 48/44	289.4/277.4 301.6/288.6 316.6/302.2	350/350 350/350 400/350
460	414-508	34.6	173	34.6	173	9.9	7.5	11.0	98.8	125	6 10 15	9.6 15.2 22.0	108.4 114.0 120.8	125 125 150
							10	14.0	101.8	125	6 10 15	9.6 15.2 22.0	111.4 117.0 123.8	125 150 150
							15	21.0	108.8	125	6 10 15	9.6 15.2 22.0	118.4 124.0 130.8	150 150 150
							20	27.0	114.8	125	6 10 15	9.6 15.2 22.0	124.4 130.0 136.8	150 150 150
							25	34.0	121.8	150	6 10 15	9.6 15.2 22.0	131.4 137.0 143.8	150 150 175
							30	40.0	129.1	150	6 10 15	9.6 15.2 22.0	138.7 144.3 151.1	175 175 175
575	518-632	26.7	120	26.7	120	7.2	7.5	9.0	76.3	100	6 10 15	7.8 12.2 18.0	84.1 88.5 94.3	110 110 110
							10	11.0	78.3	100	6 10 15	7.8 12.2 18.0	86.1 90.5 96.3	110 110 110
							15	17.0	84.3	110	6 10 15	7.8 12.2 18.0	92.1 96.5 102.3	110 110 125
							20	22.0	89.3	110	6 10 15	7.8 12.2 18.0	97.1 101.5 107.3	110 125 125
							25	27.0	94.4	110	6 10 15	7.8 12.2 18.0	102.2 106.6 112.4	125 125 125
							30	32.0	100.6	125	6 10 15	7.8 12.2 18.0	108.4 112.8 118.6	125 125 150

LEGEND

FLA — Full Load Amps
Hp — Nominal Horsepower
IFM — Indoor (Supply) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing)
MOCP — Maximum Overcurrent Protection
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

NOTE: Units use 1 (low heat) or 2 (high heat) combustion fan motors rated at 0.3 FLA each.

Table 10 — Electrical Data, 48ZA,ZE,ZJ050 Units

NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE	COMPR NO. 1		COMPR NO. 2		OFM	IFM		BASE UNIT ONLY		EXHAUST FAN		BASE UNIT WITH EXHAUST FAN	
		RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	MCA	MOCP	Total Hp	Total FLA	MCA	MOCP
208/230	187-254	89.7	446	69.2	345	19.8	7.5	24.2/22.0	225.3/223.1	300/300	6 10 15	21.2/20.0 33.4/30.0 48.4/44.0	246.5/242.3 258.7/253.5 273.7/267.1	300/300 300/300 350/350
							10	30.8/28.0	231.9/229.1	300/300	6 10 15	21.2/20.0 33.4/30.0 48.4/44.0	253.1/248.3 265.3/259.5 280.3/273.1	300/300 350/350 350/350
							15	46.2/42.0	247.2/243.1	300/300	6 10 15	21.2/20.0 33.4/30.0 48.4/44.0	268.5/262.3 280.7/273.5 295.7/287.1	350/350 350/350 350/350
							20	59.4/54.0	260.5/255.1	350/300	6 10 15	21.2/20.0 33.4/30.0 48.4/44.0	281.7/274.3 293.9/285.5 308.9/299.1	350/350 350/350 350/350
							25	74.8/68.0	275.9/269.1	350/350	6 10 15	22.0/20.0 34.0/30.0 48.0/44.0	297.1/288.3 309.3/299.5 324.3/313.1	350/350 350/350 400/400
							30	88.0/88.0	289.1/281.1	350/350	6 10 15	22.0/20.0 34.0/30.0 48.0/44.0	310.3/300.3 322.5/311.5 337.5/325.1	400/350 400/400 400/400
460	414-508	43.6	223	34.6	173	9.9	7.5	11.0	110.0	150	6 10 15	9.6 15.2 22.0	119.6 125.2 132.0	150 150 175
							10	14.0	113.0	150	6 10 15	9.6 15.2 22.0	122.6 128.2 135.0	150 150 175
							15	21.0	120.0	150	6 10 15	9.6 15.2 22.0	129.6 135.2 142.0	150 175 175
							20	27.0	126.0	150	6 10 15	9.6 15.2 22.0	135.6 141.2 148.0	175 175 175
							25	34.0	133.0	175	6 10 15	9.6 15.2 22.0	142.6 148.2 155.0	175 175 175
							30	40.0	139.0	175	6 10 15	9.6 15.2 22.0	148.6 154.2 161.0	175 175 200
575	518-632	36.5	164	26.7	120	7.2	7.5	9.0	88.5	125	6 10 15	7.8 12.2 18.0	96.3 100.7 106.5	125 125 125
							10	11.0	90.5	125	6 10 15	7.8 12.2 18.0	98.3 102.7 108.5	125 125 125
							15	17.0	96.5	125	6 10 15	7.8 12.2 18.0	104.3 108.7 114.5	125 125 150
							20	22.0	101.5	125	6 10 15	7.8 12.2 18.0	109.3 113.7 119.5	125 150 150
							25	27.0	106.5	125	6 10 15	7.8 12.2 18.0	114.3 118.7 124.5	150 150 150
							30	32.0	111.5	125	6 10 15	7.8 12.2 18.0	119.3 123.7 129.5	150 150 150

LEGEND

FLA — Full Load Amps
Hp — Nominal Horsepower
IFM — Indoor (Supply) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing)
MOCP — Maximum Overcurrent Protection
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

NOTE: Units use 1 (low heat) or 2 (high heat) combustion fan motors rated at 0.3 FLA each.

Table 11 — Electrical Data, 48ZA,ZE,ZJ055 Units

NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE	COMPR NO. 1		COMPR NO. 2		OFM	IFM		BASE UNIT ONLY		EXHAUST FAN		BASE UNIT WITH EXHAUST FAN	
		RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	MCA	MOCP	Total Hp	Total FLA	MCA	MOCP
208/230	187-254	108	506	74.4	345	26.4	15	46.2/42	281.6/277.4	350/350	10 15 20	34/30 48/44 62/56	315.0/307.4 330.0/321.4 343.2/333.4	400/400 400/400 450/400
							20	59.4/54	294.8/289.4	400/350	10 15 20	34/30 48/44 62/56	328.2/319.4 343.2/333.4 356.4/345.4	400/400 450/400 450/450
							25	74.8/68	310.2/303.4	400/400	10 15 20	34/30 48/44 62/56	343.6/333.4 358.6/347.4 371.8/359.4	450/400 450/450 450/450
							30	88.0/80	323.4/315.4	400/400	10 15 20	34/30 48/44 62/56	356.8/345.4 371.8/359.4 385.0/371.4	450/450 450/450 450/450
							40	114.4/104	351.5/339.4	450/400	10 15 20	34/30 48/44 62/56	384.9/369.8 399.9/383.4 412.6/395.4	450/450 500/450 500/500
460	414-508	50.6	253	34.6	173	13.2	15	21.0	132.1	175	10 15 20	15.2 22.0 28.0	147.3 154.1 160.1	175 200 200
							20	27.0	138.1	175	10 15 20	15.2 22.0 28.0	153.3 160.1 166.1	200 200 200
							25	34.0	145.1	175	10 15 20	15.2 22.0 28.0	160.3 167.1 173.1	200 200 200
							30	40.0	151.1	200	10 15 20	15.2 22.0 28.0	166.3 173.1 179.1	200 200 225
							40	52.0	163.4	200	10 15 20	15.2 22.0 28.0	178.6 185.4 191.4	225 225 225
575	518-632	39.1	176	28.8	120	9.6	15	17.0	104.3	125	10 15 20	12.2 18.0 22.0	116.5 122.3 126.3	150 150 150
							20	22.0	109.3	125	10 15 20	12.2 18.0 22.0	121.5 127.3 131.3	150 150 150
							25	27.0	114.3	150	10 15 20	12.2 18.0 22.0	126.5 132.3 136.3	150 150 175
							30	32.0	119.3	150	10 15 20	12.2 18.0 22.0	131.5 137.3 141.3	150 175 175
							40	41.0	128.8	150	10 15 20	12.2 18.0 22.0	141.0 146.8 150.8	175 175 175

LEGEND

FLA — Full Load Amps
Hp — Nominal Horsepower
IFM — Indoor (Supply) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing)
MOCP — Maximum Overcurrent Protection
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

NOTE: Units use 2 (low heat) or 3 (high heat) combustion fan motors rated at 0.3 FLA each.

Table 12 — Electrical Data, 48ZA,ZE,ZJ060 Units

NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE	COMPR NO. 1		COMPR NO. 2		OFM	IFM		BASE UNIT ONLY		EXHAUST FAN		BASE UNIT WITH EXHAUST FAN	
		RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	MCA	MOCP	Total Hp	Total FLA	MCA	MOCP
208/230	187-254	108	506	108	506	26.4	15	46.2/42	314.9/310.7	400/400	10 15 20	34/30 48/44 62/56	348.3/340.7 363.3/354.7 376.6/366.7	450/400 450/450 450/450
							20	59.4/54	328.1/322.7	400/400	10 15 20	34/30 48/44 62/56	361.5/352.7 376.5/366.7 389.7/378.7	450/450 450/450 450/450
							25	74.8/68	343.5/336.7	450/400	10 15 20	34/30 48/44 62/56	376.9/366.7 391.9/380.7 405.1/392.7	450/450 450/450 500/500
							30	88.0/80	356.7/348.7	450/450	10 15 20	34/30 48/44 62/56	390.1/378.7 405.1/392.7 418.3/404.7	450/450 500/500 500/500
							40	114.4/104	384.8/372.7	450/450	10 15 20	34/30 48/44 62/56	418.2/403.1 433.2/416.7 445.9/428.7	500/500 500/500 500/500
460	414-508	50.6	253	50.6	253	13.2	15	21.0	148.1	175	10 15 20	15.2 22.0 28.0	163.3 170.1 176.1	200 200 200
							20	27.0	154.1	200	10 15 20	15.2 22.0 28.0	169.3 176.1 182.1	200 225 225
							25	34.0	161.1	200	10 15 20	15.2 22.0 28.0	176.3 183.1 189.1	225 225 225
							30	40.0	167.1	200	10 15 20	15.2 22.0 28.0	182.3 189.1 195.1	225 225 225
							40	52.0	179.4	225	10 15 20	15.2 22.0 28.0	194.6 201.4 207.4	225 250 250
575	518-632	39.1	176	39.1	176	9.6	15	17.0	114.6	150	10 15 20	12.2 18.0 22.0	126.8 132.6 136.6	150 150 175
							20	22.0	119.6	150	10 15 20	12.2 18.0 22.0	131.8 137.6 141.6	150 175 175
							25	27.0	124.6	150	10 15 20	12.2 18.0 22.0	136.8 142.6 146.6	175 175 175
							30	32.0	129.6	150	10 15 20	12.2 18.0 22.0	141.8 147.6 151.6	175 175 175
							40	41.0	139.6	175	10 15 20	12.2 18.0 22.0	151.3 157.1 161.1	175 175 200

LEGEND

FLA — Full Load Amps
Hp — Nominal Horsepower
IFM — Indoor (Supply) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing)
MOCP — Maximum Overcurrent Protection
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

NOTE: Units use 2 (low heat) or 3 (high heat) combustion fan motors rated at 0.3 FLA each.

Table 13 — Electrical Data, 48ZA,ZE,ZJ070 Units

NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE	COMPR NO. 1		COMPR NO. 2		OFM	IFM		BASE UNIT ONLY		EXHAUST FAN		BASE UNIT WITH EXHAUST FAN	
		RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	MCA	MOCP	Total Hp	Total FLA	MCA	MOCP
208/230	187-254	108	506	142	690	33.0	15	46.2/42	364.8/360.6	500/500	10 15 20	34/30 48/44 62/56	398.2/390.6 413.2/404.6 426.4/416.6	500/500 500/500 500/500
							20	59.4/54	378.0/372.6	500/500	10 15 20	34/30 48/44 62/56	411.4/402.6 426.4/416.6 439.6/428.6	500/500 500/500 500/500
							25	74.8/68	393.4/386.6	500/500	10 15 20	34/30 48/44 62/56	426.8/416.6 441.8/430.6 455.0/442.6	500/500 500/500 500/500
							30	88.0/80	406.6/389.6	500/500	10 15 20	34/30 48/44 62/56	440.0/428.6 455.0/442.6 468.2/454.6	500/500 500/500 600/500
							40	114.4/104.0	433.0/422.6	500/500	10 15 20	34/30 48/44 62/56	466.4/453.0 481.4/466.6 494.1/478.6	600/500 600/600 600/600
460	414-508	50.6	253	65.4	345	16.5	15	21.0	169.9	225	10 15 20	15.2 22.0 28.0	185.1 191.9 197.9	250 250 250
							20	27.0	175.9	225	10 15 20	15.2 22.0 28.0	191.1 197.9 203.9	250 250 250
							25	34.0	182.9	225	10 15 20	15.2 22.0 28.0	198.1 204.9 210.9	250 250 275
							30	40.0	188.9	250	10 15 20	15.2 22.0 28.0	204.1 210.9 216.9	250 275 275
							40	52.0	200.9	250	10 15 20	15.2 22.0 28.0	216.1 222.9 228.9	250 250 250
575	518-632	39.1	176	52.6	276	12.0	15	17.0	133.9	175	10 15 20	12.2 18.0 22.0	146.1 151.9 155.9	175 200 200
							20	22.0	138.9	175	10 15 20	12.2 18.0 22.0	151.1 156.9 160.9	200 200 200
							25	27.0	143.9	175	10 15 20	12.2 18.0 22.0	156.1 161.9 165.9	200 200 200
							30	32.0	148.9	200	10 15 20	12.2 18.0 22.0	161.1 166.9 170.9	200 200 200
							40	41.0	157.9	200	10 15 20	12.2 18.0 22.0	170.1 175.9 179.9	200 225 225

LEGEND

FLA — Full Load Amps
Hp — Nominal Horsepower
IFM — Indoor (Supply) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing)
MOCP — Maximum Overcurrent Protection
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

NOTE: Units use 2 (low heat) or 3 (high heat) combustion fan motors rated at 0.3 FLA each.

Table 14 — Electrical Data — 48ZA,ZE,ZJ075-105 Units

SIZE	VOLTAGE (V-Ph-Hz)	VOLTAGE RANGE	COMPRESSOR								OFM	IFM		BASE UNIT ONLY		OPTIONAL POWER EXHAUST FAN		BASE UNIT WITH EXHAUST FAN	
			No. 1		No. 2		No. 3		No. 4										
			RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	MCA	MOCP	Total Hp	Total FLA	MCA	MOCP
075	460-3-60	414-508	50.6	253	65.4	345	—	—	—	—	16.5	30	40.0	188.9	250	10	15.2	204.1	250
																15	22.0	210.9	250
																20	28.0	216.9	250
												40	52.0	200.9	250	10	15.2	216.1	250
																15	22.0	222.9	250
																20	28.0	228.9	250
												50	65.0	213.9	250	10	15.2	229.1	250
																15	22.0	235.9	300
																20	28.0	241.9	300
												60	77.0	228.8	300	10	15.2	244.0	300
																15	22.0	250.8	300
																20	28.0	256.8	300
												75	96.0	252.5	300	10	15.2	267.7	300
																15	22.0	274.5	350
																20	28.0	280.5	350
090	460-3-60	414-508	65.4	345	65.4	345	—	—	—	—	19.8	30	40.0	207.0	250	10	15.2	222.2	350
																15	22.0	229.0	250
																20	28.0	235.0	300
												40	52.0	219.0	250	10	15.2	234.2	250
																15	22.0	241.0	300
																20	28.0	247.0	300
												50	65.0	232.0	250	10	15.2	247.2	300
																15	22.0	254.0	300
																20	28.0	260.0	300
												60	77.0	246.9	300	10	15.2	262.1	300
																15	22.0	268.9	300
																20	28.0	274.9	300
												75	96.0	270.6	350	10	15.2	285.8	350
																15	22.0	292.6	350
																20	28.0	298.6	350
105	460-3-60	414-508	50.6	253	34.6	173	50.6	253	34.6	173	19.8	30	40.0	242.9	250	10	15.2	258.1	300
																15	22.0	264.9	300
																20	28.0	270.9	300
												40	52.0	255.2	300	10	15.2	270.4	300
																15	22.0	277.2	300
																20	28.0	283.2	300
												50	65.0	271.5	300	10	15.2	286.7	350
																15	22.0	293.5	350
																20	28.0	299.5	350
												60	77.0	286.5	350	10	15.2	301.7	350
																15	22.0	308.5	350
																20	28.0	314.5	350
												75	96.0	310.2	400	10	15.2	325.4	400
																15	22.0	332.2	400
																20	28.0	338.2	400

LEGEND

FLA — Full Load Amps
Hp — Nominal Horsepower
IFM — Indoor (Evaporator) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing
MOCP — Maximum Overcurrent Protection
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

NOTE: Units use 2 (low heat) or 3 (high heat) combustion fan motors rated at 460 v, single-phase, 60 Hertz and 0.3 FLA each.

Table 15 — Electrical Data — 48ZC,ZL,ZR075-105 Units

UNIT SIZE	VOLTAGE (3 Ph, 60 Hz	VOLTAGE RANGE		COMPRESSOR								CONDENSER FAN MOTOR		EVAPORATOR FAN MOTOR		RETURN/ EXHAUST FAN		POWER SUPPLY	
				No. 1		No. 2		No. 3		No.4									
		Min	Max	RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	Qty	FLA	Hp	FLA	Hp	FLA (total)	MCA	MOCP
075	460	414	508	50.6	253	65.4	345	—	—	—	—	5	3.3 (ea)	30	40.0	20	27	215.9	250
																25	34	222.9	250
																30	40	228.9	250
																40	52	240.9	300
														40	52.0	20	27	227.9	250
																25	34	234.9	300
																30	40	240.9	300
																40	52	252.9	300
														50	65.0	20	27	240.9	300
																25	34	247.9	300
																30	40	253.9	300
																40	52	265.9	300
														60	77.0	20	27	255.8	300
																25	34	262.8	300
																30	40	268.8	300
																40	52	280.8	350
														75	96.0	20	27	279.5	350
																25	34	286.5	350
																30	40	292.5	350
																40	52	304.5	400
090	460	414	508	65.4	345	65.4	345	—	—	—	—	6	3.3 (ea)	30	40.0	20	27	234.0	250
																25	34	241.0	300
																30	40	247.0	300
																40	52	259.0	300
														40	52.0	20	27	246.0	300
																25	34	253.0	300
																30	40	259.0	300
																40	52	271.0	300
														50	65.0	20	27	259.0	300
																25	34	266.0	300
																30	40	272.0	300
																40	52	284.0	300
														60	77.0	20	27	273.9	350
																25	34	280.9	350
																30	40	286.9	350
																40	52	298.9	350
														75	96.0	20	27	297.6	350
																25	34	304.6	400
																30	40	310.6	400
																40	52	322.6	400
105	460	414	508	50.6	253	50.6	253	34.6	173	34.6	173	6	3.3 (ea)	30	40.0	20	27	269.9	300
																25	34	276.9	300
																30	40	282.9	300
																40	52	294.9	300
														40	52.0	20	27	282.2	300
																25	34	289.2	300
																30	40	295.2	300
																40	52	307.2	350
														50	65.0	20	27	298.5	350
																25	34	305.5	350
																30	40	311.5	350
																40	52	323.5	350
														60	77.0	20	27	313.5	350
																25	34	320.5	350
																30	40	326.5	400
																40	52	338.5	400
														75	96.0	20	27	337.2	400
																25	34	344.2	400
																30	40	350.2	400
																40	52	362.2	450

LEGEND

FLA — Full Load Amps
Hp — Nominal Horsepower
IFM — Indoor (Evaporator) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing
MOCP — Maximum Overcurrent Protection
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

NOTE: Units use 2 (low heat) or 3 (high heat) combustion fan motors rated at 460 v, single-phase, 60 Hertz and 0.3 FLA each.

Table 16 — Electrical Data — 48ZT,ZV,ZW075-105 Units

UNIT SIZE	VOLTAGE 3 PH, 60 Hz	VOLTAGE RANGE	COMPRESSOR								OFM	IFM			EXHAUST FAN		BASE UNIT WITH EXHAUST FAN	
			No. 1		No. 2		No. 3		No. 4									
			RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	LRA	Total Hp	Total FLA	MCA	MOCP
075	460	414-508	50.6	253	65.4	345	—	—	—	—	16.5	30	40.0	230	20	28	216.9	250
															30	42	230.9	250
															40	54	242.9	300
															50	68	256.9	300
															60	80	268.9	300
												40	52.0	304	20	28	228.9	250
															30	42	242.9	300
															40	54	254.9	300
															50	68	268.9	300
															60	80	280.9	300
												50	65.0	370	20	28	241.9	300
															30	42	255.9	300
															40	54	267.9	300
															50	68	281.9	300
															60	80	293.9	350
												60	77.0	453	20	28	256.8	300
															30	42	270.8	300
															40	54	282.8	350
															50	68	296.8	350
															60	80	308.8	350
												75	96.0	—	20	28	280.5	350
															30	42	294.5	350
															40	54	306.5	400
															50	68	320.5	400
															60	80	332.5	400
	575	518-632	39.1	176	52.6	276	—	—	—	—	12.0	30	32.0	—	20	22	170.9	200
															30	34	182.9	225
															40	44	192.9	225
															50	54	202.9	250
															60	64	212.9	250
												40	41.0	—	20	22	179.9	225
															30	34	191.9	225
															40	44	201.9	250
															50	54	211.9	250
															60	64	221.9	250
												50	52.0	—	20	22	190.9	225
															30	34	202.9	250
															40	44	212.9	250
															50	54	222.9	250
															60	64	232.9	250
												60	62.0	—	20	22	203.2	250
															30	34	215.2	250
															40	44	225.2	250
															50	54	235.2	250
															60	64	245.2	300
090	460	414-508	65.4	345	65.4	345	—	—	—	—	19.8	30	40.0	230	20	28	235.0	300
															30	42	249.0	300
															40	54	261.0	300
															50	68	275.0	300
															60	80	287.0	350
												40	52.0	304	20	28	247.0	300
															30	42	261.0	300
															40	54	273.0	300
															50	68	287.0	350
															60	80	299.0	350
												50	65.0	370	20	28	260.0	300
															30	42	274.0	300
															40	54	286.0	350
															50	68	300.0	350
															60	80	312.0	350
												60	77.0	453	20	28	274.9	350
															30	42	288.9	350
															40	54	300.9	350
															50	68	314.9	350
															60	80	326.9	400
												75	96.0	—	20	28	298.6	350
															30	42	312.6	400
															40	54	324.6	400
															50	68	338.6	400
															60	80	350.6	400

Table 16 — Electrical Data — 48ZT,ZV,ZW075-105 Units (cont)

UNIT SIZE	VOLTAGE 3 PH, 60 Hz	VOLTAGE RANGE	COMPRESSOR								OFM	IFM			EXHAUST FAN		BASE UNIT WITH EXHAUST FAN	
			No. 1		No. 2		No. 3		No. 4									
			RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	LRA	Total Hp	Total FLA	MCA	MOCP
090	575	518-632	52.6	276	52.6	276	—	—	—	—	14.4	30	32.0	—	20	22	186.8	225
															30	34	198.8	250
															40	44	208.8	250
															50	54	218.8	250
															60	64	228.8	250
												40	41.0	—	20	22	195.8	225
															30	34	207.8	250
															40	44	217.8	250
															50	54	227.8	250
															60	64	237.8	250
												50	52.0	—	20	22	206.8	250
															30	34	218.8	250
															40	44	228.8	250
															50	54	238.8	250
															60	64	248.8	300
												60	62.0	—	20	22	219.1	250
															30	34	231.1	250
															40	44	241.1	300
															50	54	251.1	300
															60	64	261.1	300
105	460	414-508	50.6	253	34.6	173	50.6	253	34.6	173	19.8	30	40.0	230	20	28	270.9	300
															30	42	284.9	300
															40	54	296.9	300
															50	68	310.9	350
															60	80	322.9	350
												40	52.0	304	20	28	283.2	300
															30	42	297.2	300
															40	54	309.2	350
															50	68	323.2	350
															60	80	335.2	350
												50	65.0	370	20	28	299.5	350
															30	42	313.5	350
															40	54	325.5	350
															50	68	339.5	400
															60	80	351.5	400
												60	77.0	453	20	28	314.5	350
															30	42	328.5	400
															40	54	340.5	400
															50	68	354.5	400
															60	80	366.5	400
												75	96.0	—	20	28	338.2	400
															30	42	352.2	400
															40	54	364.2	450
															50	68	378.2	450
															60	80	390.2	450
	575	518-632	39.1	176	26.7	120	39.1	176	26.7	120	14.4	30	32.0	—	20	22	209.8	225
															30	34	221.8	250
															40	44	231.8	250
															50	54	241.8	250
															60	64	251.8	300
												40	41.0	—	20	22	219.3	250
															30	34	231.3	250
															40	44	241.3	250
															50	54	251.3	300
															60	64	261.3	300
												50	52.0	—	20	22	233.0	250
															30	34	245.0	250
															40	44	255.0	300
															50	54	265.0	300
															60	64	275.0	300
												60	62.0	—	20	22	245.5	300
															30	34	257.5	300
															40	44	267.5	300
															50	54	277.5	300
															60	64	287.5	300

LEGEND

FLA — Full Load Amps
Hp — Nominal Horsepower
IFM — Indoor (Evaporator) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing)
MOCP — Maximum Overcurrent Protection
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

NOTE: Units use 2 (low heat) or 3 (high heat) combustion fan motors rated at 460 v, single-phase, 60 Hertz and 0.3 FLA each.

Air Pressure Tubing — Before options such as Inlet Guide Vanes (IGV), Variable Frequency Drive (VFD), and/or Modulating Power Exhaust can operate properly, the pneumatic tubing for pressure sensing must be installed. Use fire-retardant plenum tubing (field-supplied). Tubing size depends on type of control device (see Table 17 below). Tubing must be run from the appropriate sensing location (in the duct or in the building space) to the control device location in the unit.

Table 17 — Tubing Size

OPTION	UNIT	NOMINAL TUBE SIZE (OD) (in.)	ACTUAL TUBE SIZE (ID) (in.)
Inlet Guide Vanes (IGV)	48ZE,ZR,ZV	3/8	0.187
	48ZJ,ZL,ZW	1/4	0.170
Variable Frequency Drive (VFD)	48ZE,ZR,ZV	1/4	0.170
	48ZJ,ZL,ZW	1/4	0.170
Modulating Power Exhaust	48ZA,ZE,ZT,ZV	3/8	0.187
	48ZJ,ZW	1/4	0.170
Return/Exhaust Fan	48ZC,ZR	3/8	0.187
	48ZL	1/4	0.170

INLET GUIDE VANES — The tubing for the duct pressure (DP) control option should sample supply duct pressure about 2/3 of the way out from the unit in the main trunk duct, at a location where a constant duct pressure is desired.

48ZE,ZR,ZV Units — On these units, the inlet guide vanes are controlled by a differential pressure switch (DPS). On sizes 030-050, the DPS is located in the auxiliary control box at the economizer end of the unit (see Fig. 48). On sizes 055-105, the DPS is located in the Supply Fan section. See Fig. 49. Use a nominal 3/8-in. plastic tubing.

48ZJ,ZL,ZW Units — On these units, the duct pressure is sensed by a pressure transducer. The output of the pressure transducer is directed to the unit control module. On all sizes, the DP transducer is located in the unit auxiliary control box. See Fig. 50 and 51. Use a nominal 1/4-in. plastic tubing.

VARIABLE FREQUENCY DRIVE — The tubing for the duct pressure (DP) control option should sample supply duct pressure about 2/3 of the way out from the unit in the main trunk duct, at a location where a constant duct pressure is desired.

48ZE,ZR,ZV Units — On these units, the duct pressure is sensed by a pressure transducer. The pressure transducer output is directed to the VFD. On size 030-050 units, the DP transducer is located in the auxiliary control box. On 055-105 units, the DP transducer is located in the fan section. See Fig. 49. Use a nominal 1/4-in. plastic tubing.

48ZJ,ZL,ZW Units — On these units, the duct pressure is sensed by a pressure transducer. The pressure transducer output is directed to the unit control module. On all sizes, the DP transducer is located in the unit auxiliary control box. See Fig. 50 and 51. Use a nominal 1/4-in. plastic tubing.

Refer to appropriate base unit Controls and Troubleshooting book for instructions on adjusting set points for duct pressure controls.

MODULATING POWER EXHAUST — The tubing for the building pressure control (achieved via the modulating power exhaust option) should sample building pressure in the area near the entrance lobby (or other appropriate and sensitive location) so that location is controlled as closely to design pressures as possible.

48ZA,ZE,ZT,ZV Units — These units use a differential pressure switch (DPS) to control the actuator on the modulating discharge damper in exhaust fan no. 1. On sizes 030-050, the building pressure (BP) DPS is located in the auxiliary control box of the unit. On sizes 055-105 the building pressure DPS is mounted below the auxiliary control box next to the access door labeled FILTER SECTION. See Fig. 48 and 52. Use a nominal 3/8-in.plastic tubing.

For instructions on adjusting BP control set points, refer to Service, Adjustments section in this book.

48ZJ,ZW Units — These units use a pressure transducer for sensing building pressure. The BP transducer is located in the unit auxiliary control box. See Fig. 53. Use a nominal 1/4-in. plastic tubing.

For instructions on adjusting BP control set points on PIC unit, refer to the Controls and Troubleshooting book for these units.

RETURN/EXHAUST POWER EXHAUST — The tubing for the building pressure control (achieved via the Return/Exhaust Power Exhaust option) should sample building pressure in the area near the entrance lobby (or other appropriate and sensitive location) so that location is controlled as closely to design pressures as possible.

48ZC,ZR Units — These units use a building pressure switch (BPS) to control the actuator on the power exhaust damper for the return/exhaust fan. The building pressure BPS (075-105 only) is mounted below the auxiliary control box of the unit next to the access door labeled FILTER SECTION. See Fig. 52. Use a nominal 3/8-in. plastic tubing.

For instructions on adjusting BPS control set points, refer to Service, Adjustments section in this book.

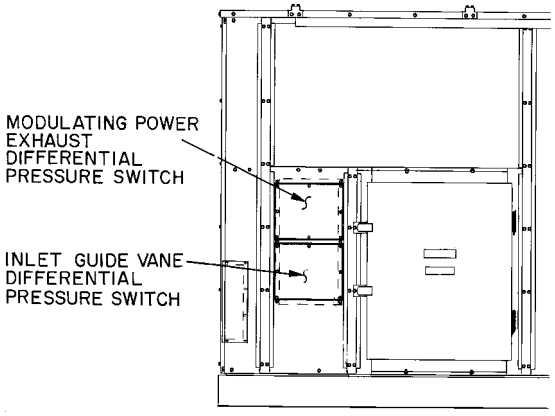


Fig. 48 — Modulating Power Exhaust and Inlet Guide Vane Differential Pressure Switch (Sizes 030-050)

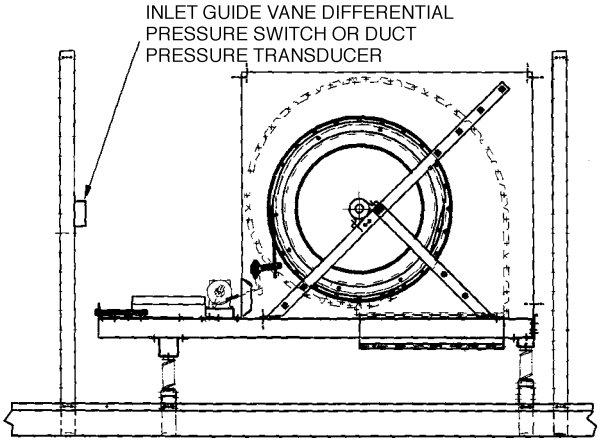


Fig. 49 — Inlet Guide Vane Differential Pressure Switch and Duct Pressure Transducer (Sizes 055-105)

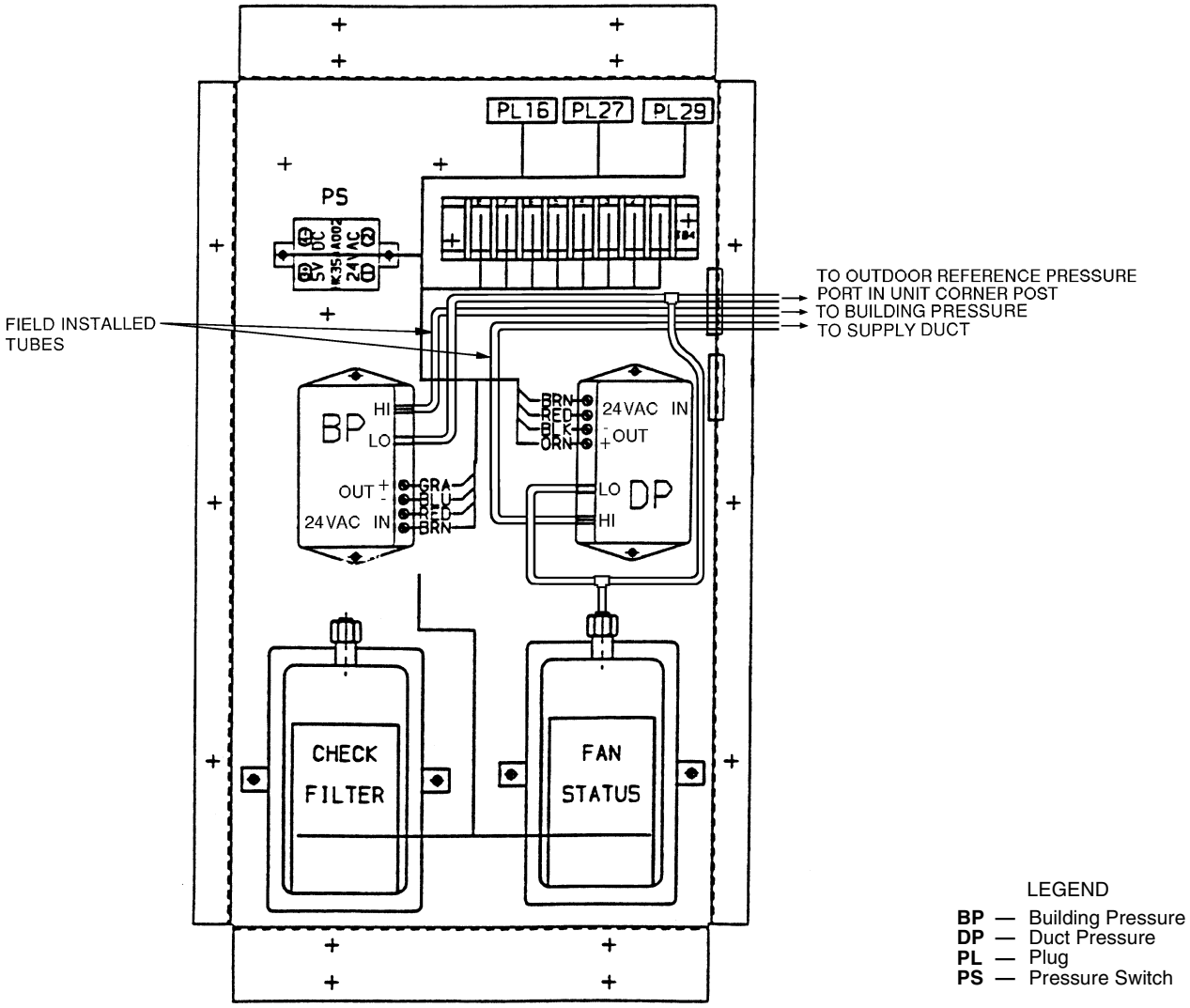


Fig. 50 — Auxiliary Control Box Details; 48ZJ030-050 Units

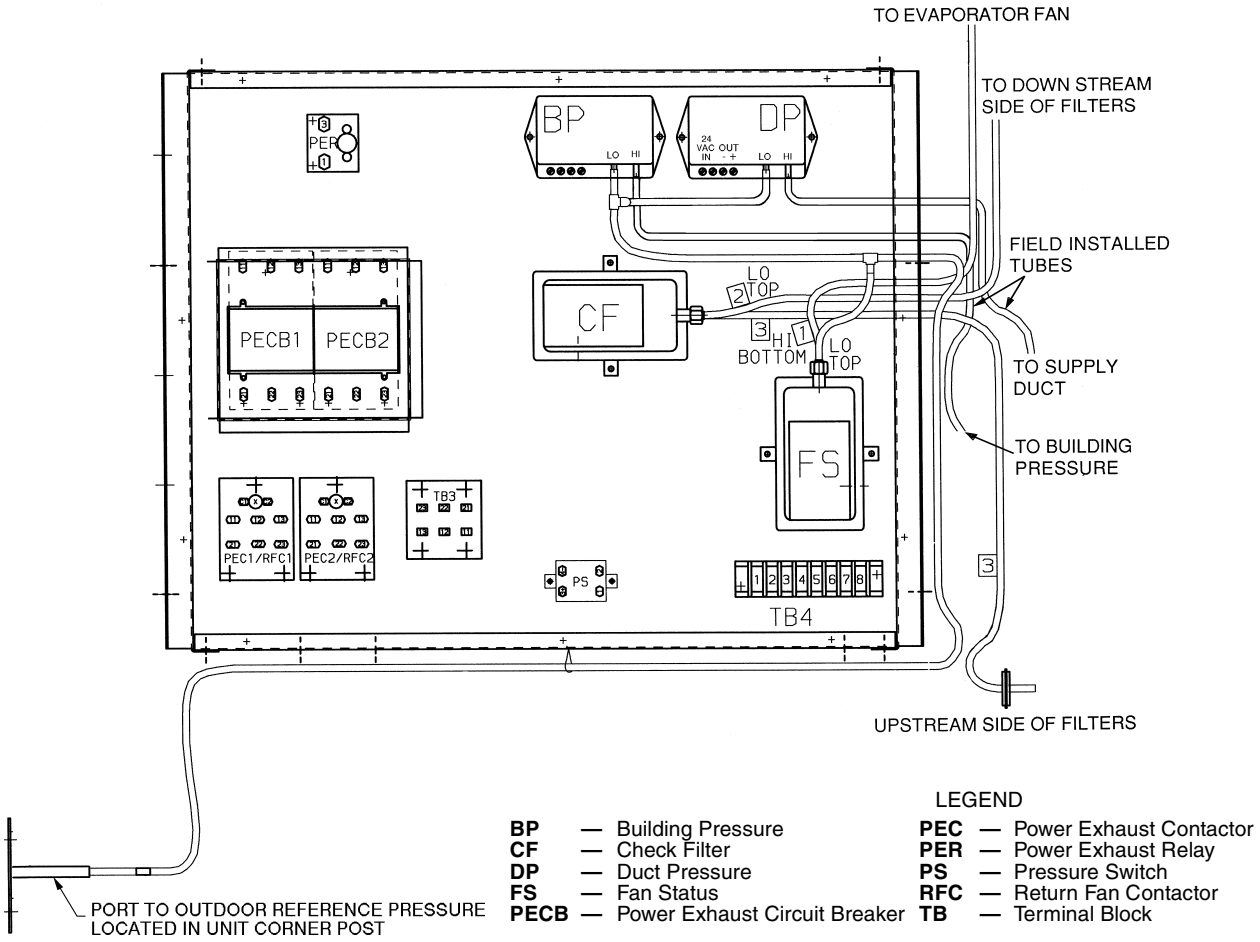


Fig. 51 — Auxiliary Control Box Details; 48ZJ,ZL,ZW055-105 Units

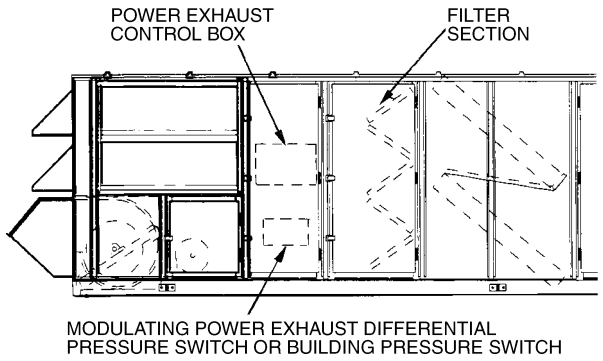

POWER EXHAUST CONTROL BOX
FILTER SECTION
MODULATING POWER EXHAUST DIFFERENTIAL PRESSURE SWITCH OR BUILDING PRESSURE SWITCH

Fig. 52 — Modulating Power Exhaust Differential Pressure Switch or Building Pressure Switch (48ZA,ZC,ZE,ZR,ZT,ZV055-105 Units)

48ZL Units — The units use a pressure transducer for sensing building pressure. The BP transducer is located in the unit auxiliary control box. See Fig. 53. Use a nominal $^1/_4$-in. plastic tubing.

For instructions on adjusting BP control set points on PIC units, refer to the Controls and Troubleshooting book for these units.

Supply-Fan Shipping Brackets — Supply-fan shipping brackets (4 per unit) must be removed from each corner of the fan sled before starting unit.

UNIT SIZES 030-050

1. To remove brackets, raise fan sled by turning adjusting bolt counterclockwise until spring is compressed slightly.
2. Remove screws holding shipping bracket to unit cross rail.
3. Remove shipping bracket (top of bracket is slotted so that it will slide out).
4. After removing all shipping brackets, level fan sled using the adjusting screws. On all 4 corners, dimension from cross rail to fan sled should be as shown in Fig. 54.

UNIT SIZES 055-070 — To remove shipping brackets, remove the 6 screws holding each bracket to the cross rail. There are 8 brackets per unit. See Fig. 55.

After removing all shipping brackets, level fan sled using the adjusting screws. On all 4 corners dimension from cross rail to fan sled should be as shown in Fig. 55.

UNIT SIZES 075-105 — Supply-fan shipping brackets must be removed from each corner of the fan sled before starting unit. To remove shipping brackets, remove the 6 screws holding each bracket to the cross rail. There are 4 brackets per unit. See Fig. 56.

After removing all shipping brackets, level fan sled using the adjusting screws. On all 4 corners dimension from cross rail to fan sled should be as shown in Fig. 56.

Return/Exhaust-Fan Shipping Brackets (48ZC, ZL,ZR Units) — Return/Exhaust fan shipping brackets must be removed from each corner of the fan sled before starting unit.

To remove shipping brackets, remove 2 screws holding each bracket to the cross rail. There are 4 brackets per unit.

After removing all shipping brackets, level the fan using the adjustment screws. On all 4 corners the dimension from cross rail to fan sled should be as shown in Fig. 57.

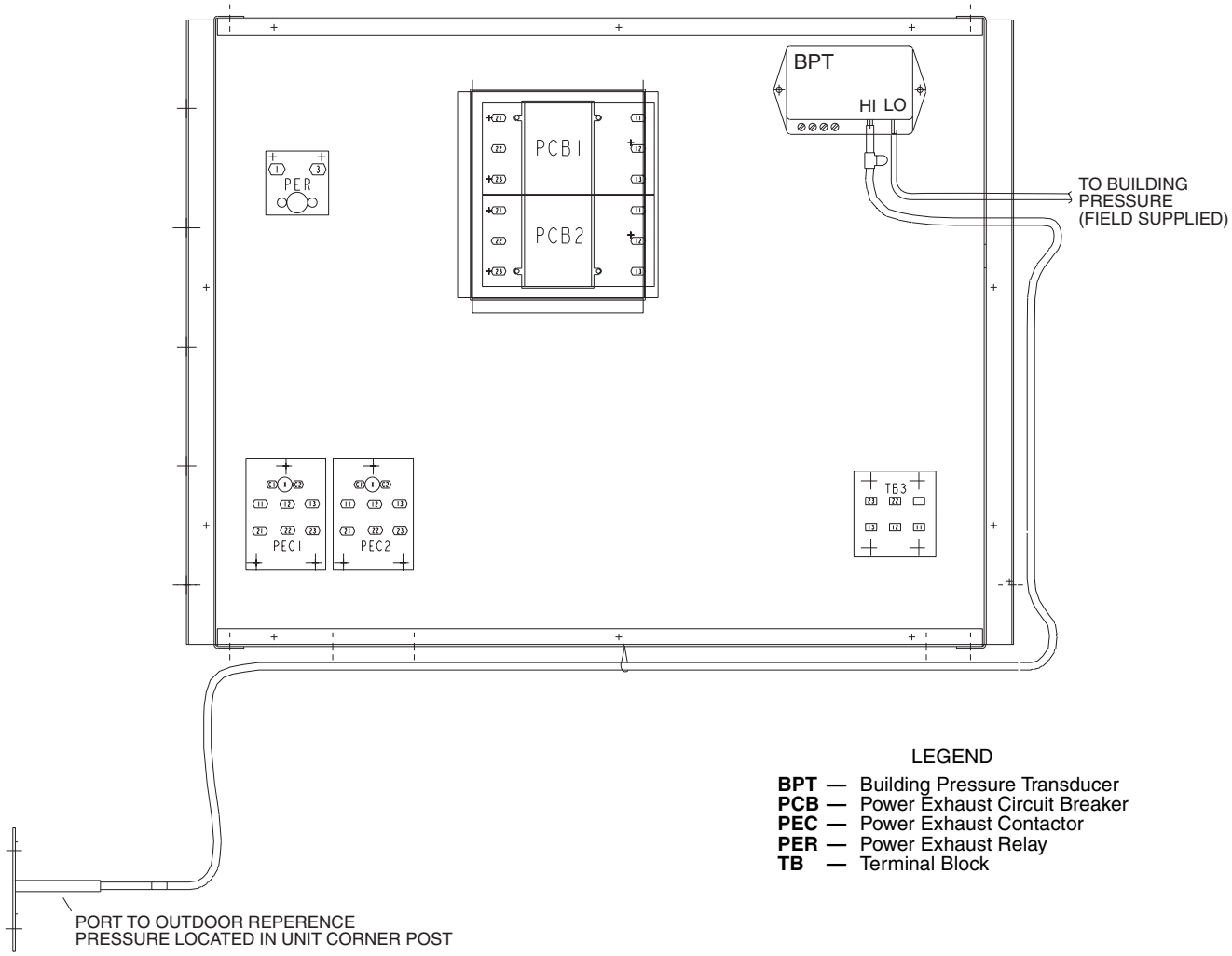


Fig. 53 — Modulating Power Exhaust Differential Pressure Switch (48ZJ,ZL,ZW055-105 Units)

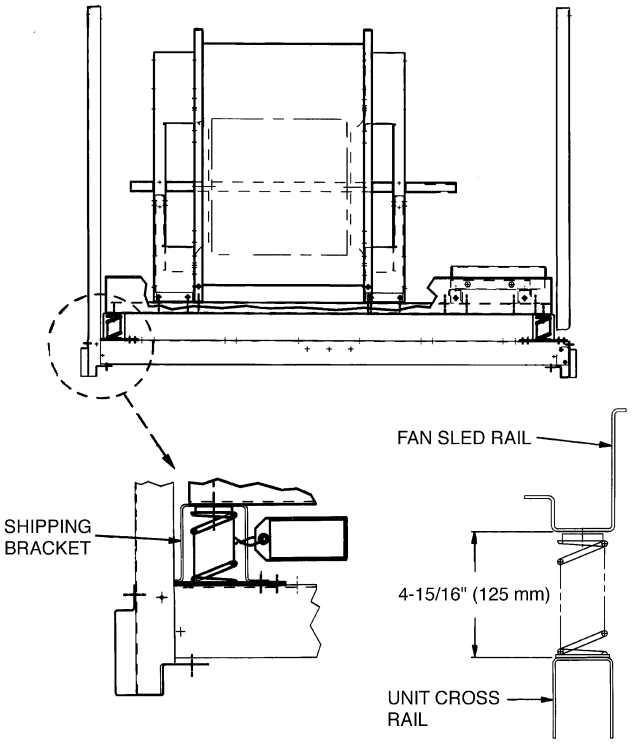


Fig. 54 — Shipping Brackets; Size 030-050 Units

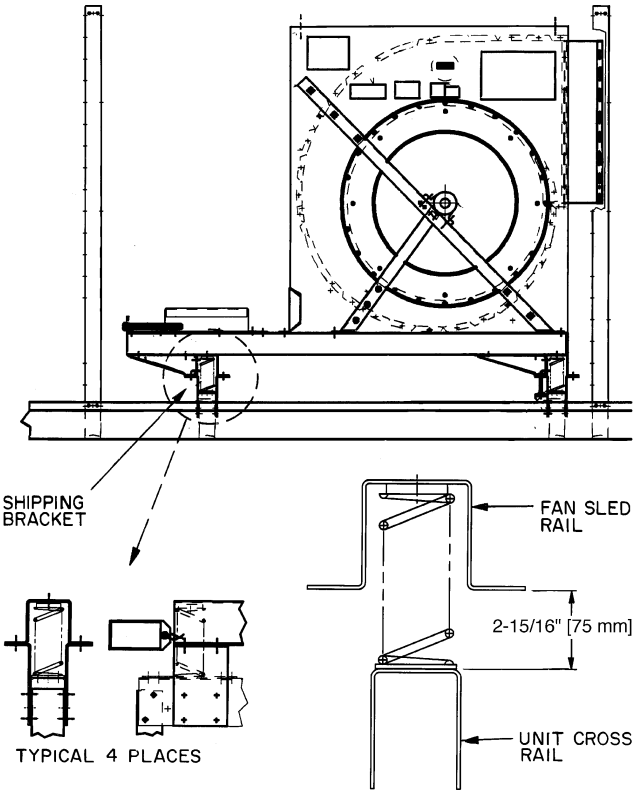


Fig. 55 — Shipping Brackets; Size 055-070 Units

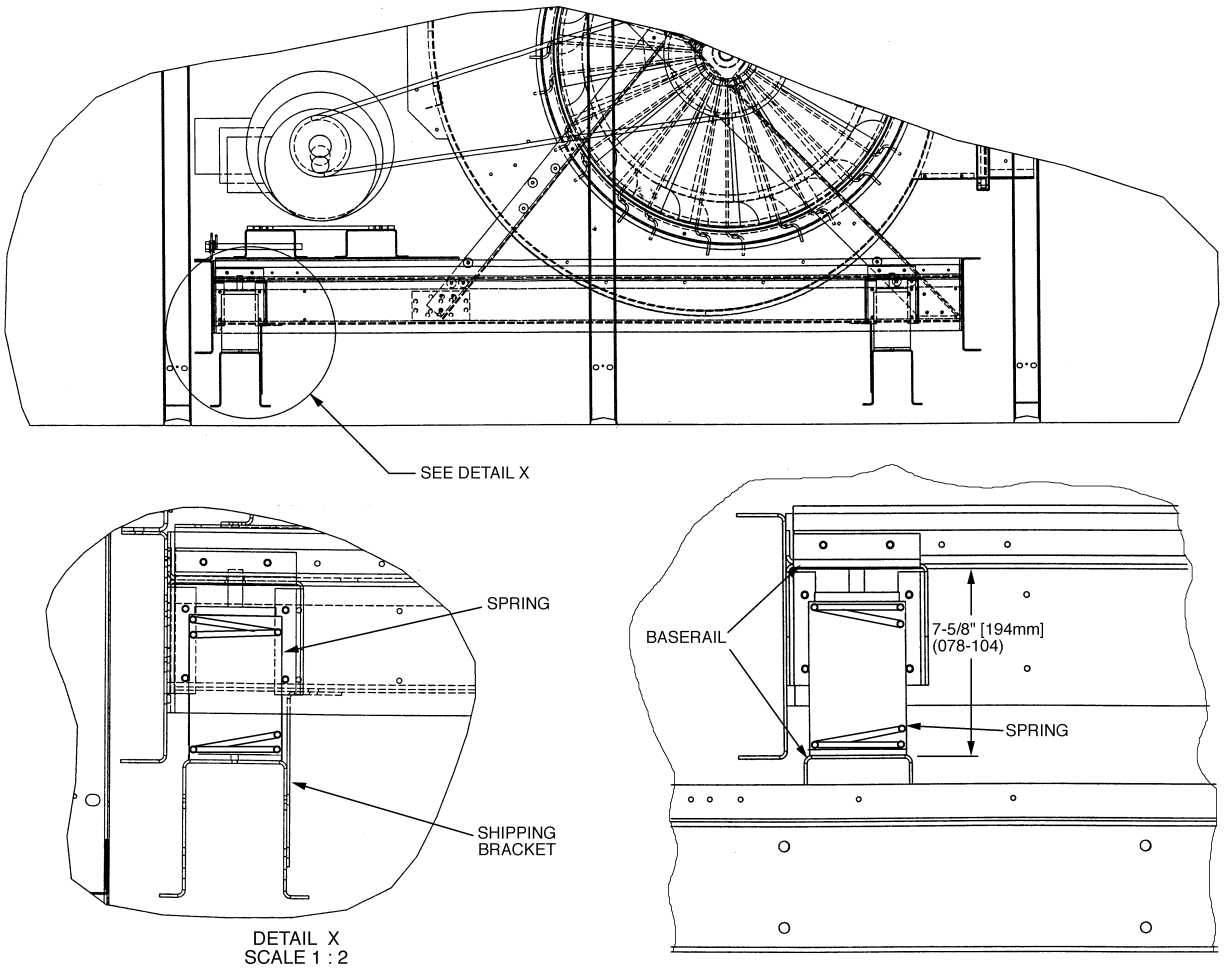


Fig. 56 — Shipping Brackets (Sizes 075-105)

Compressor Mounting

SIZES 030-090 — Each compressor is supported on 4 springs. The springs are compressed for shipment. After the unit is installed, the holddown nuts need to be loosened for normal operation. See Fig. 58 for compressor mounting details. Loosen each bolt using nut indicated until the flatwasher ($^3/_8$-in.) can be moved with finger pressure. Do not remove the locknuts. Check each compressor mounting to ensure all 4 springs have been loosened properly.

SIZE 105 — Compressors are mounted on rails and held down by rail bolts during shipment. After unit is installed, loosen the rail bolts to allow the rails and compressors to float freely on the springs located under the rails. See Fig. 59 and 60.

Install Accessories — For applications requiring accessories, the following packages are available:

All Units:
- LP Conversion Kit
- Barometric relief
- Condenser hail guard
- Differential enthalpy sensor
- Motormaster® I controller

48ZA,ZC,ZT Units:
- Time Guard® II time delay
- Modulating power exhaust
- Pressure operated unloaders
- Thermostats

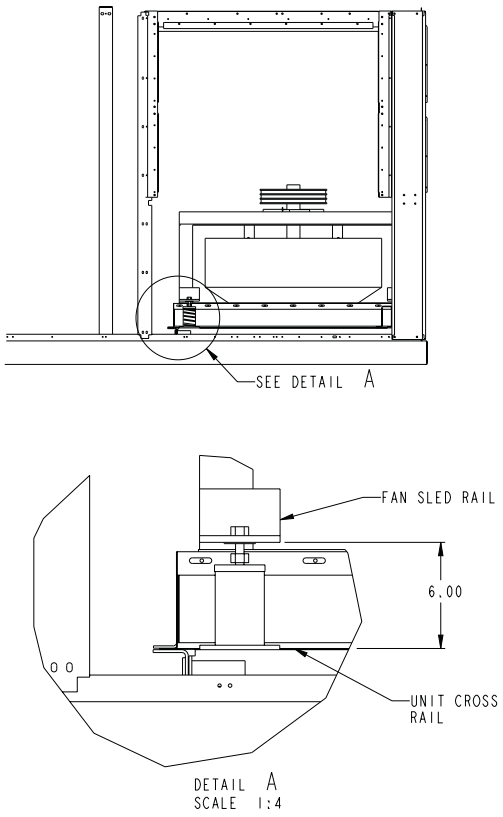


Fig. 57 — Return/Exhaust Fan Shipping Brackets

48ZE,ZR,ZV Units:
- Demand limit
- Space temperature reset
- VAV (variable air volume) remote panel
- Modulating power exhaust

48ZJ,ZL,ZW Units:
- HSIO keypad and display module
- PSIO2 control options module
- Pressure transducers
- Indoor air quality sensor
- Relative humidity sensor(s)
- Outdoor air control package

Refer to the individual accessory installation instructions in each package for information on installing accessories.

MOTORMASTER I ACCESSORY INSTALLATION — The accessory Motormaster I head pressure controller is used to control the speed of the outdoor (condenser) fan motor, permitting the unit to operate in cooling down to –20 F (–29 C) outdoor ambient temperature. See Motormaster I accessory instructions for complete installation information. See Fig. 61A-61D for location of Motormaster I sensor. See Fig. 62A and 62B for location of evaporator coil freezestat. Attach freezestat to any convenient $^1/_2$-in. (12.7-mm) tube between the header and the evaporator coil. See Fig. 63 for wind baffle dimensions.

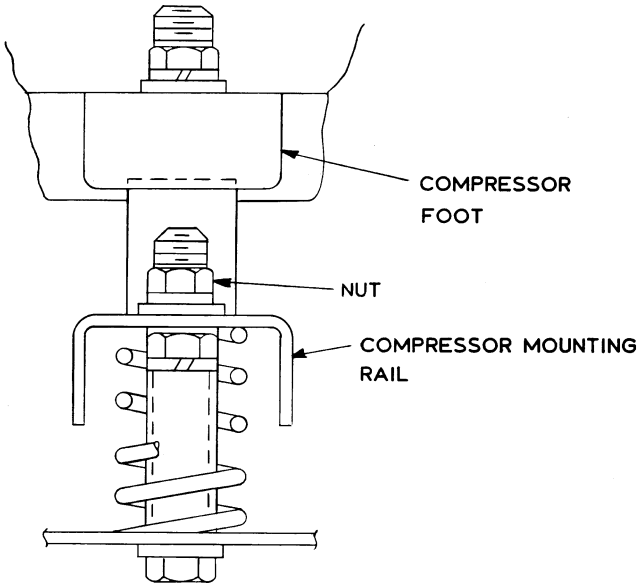
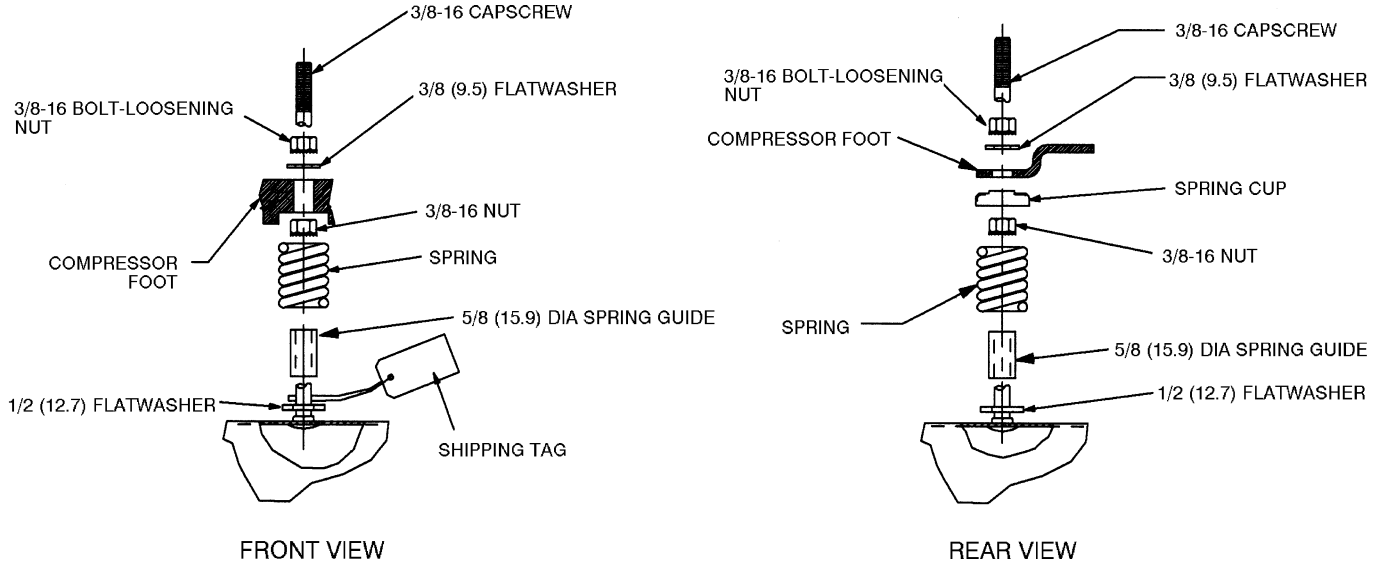


Fig. 59 — Front View of Compressor Mounting Rail Assembly — Size 105 Units



NOTE: All dimensions are in inches (mm).

Fig. 58 — Compressor Mounting (Sizes 030-090)

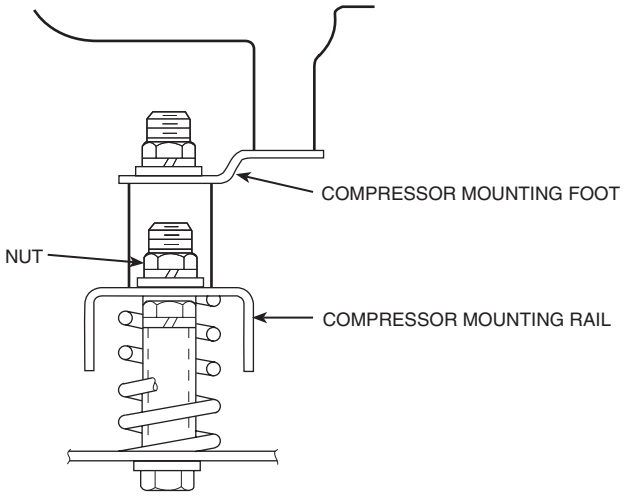


Fig. 60 — Rear View of Compressor Mounting Rail Assembly — Size 105 Units

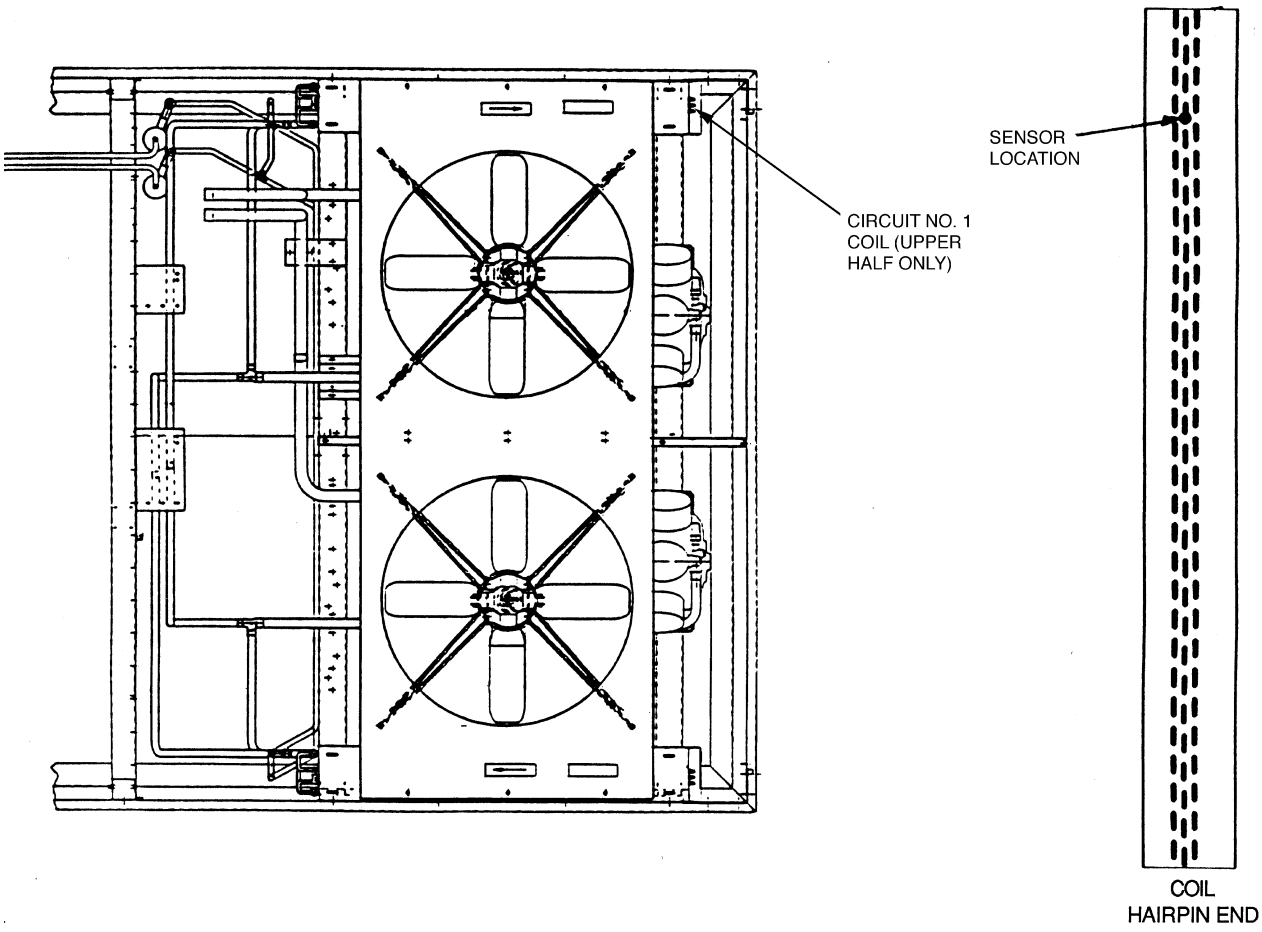


Fig. 61A — Motormaster® I Control Sensor Location, Sizes 030 and 035

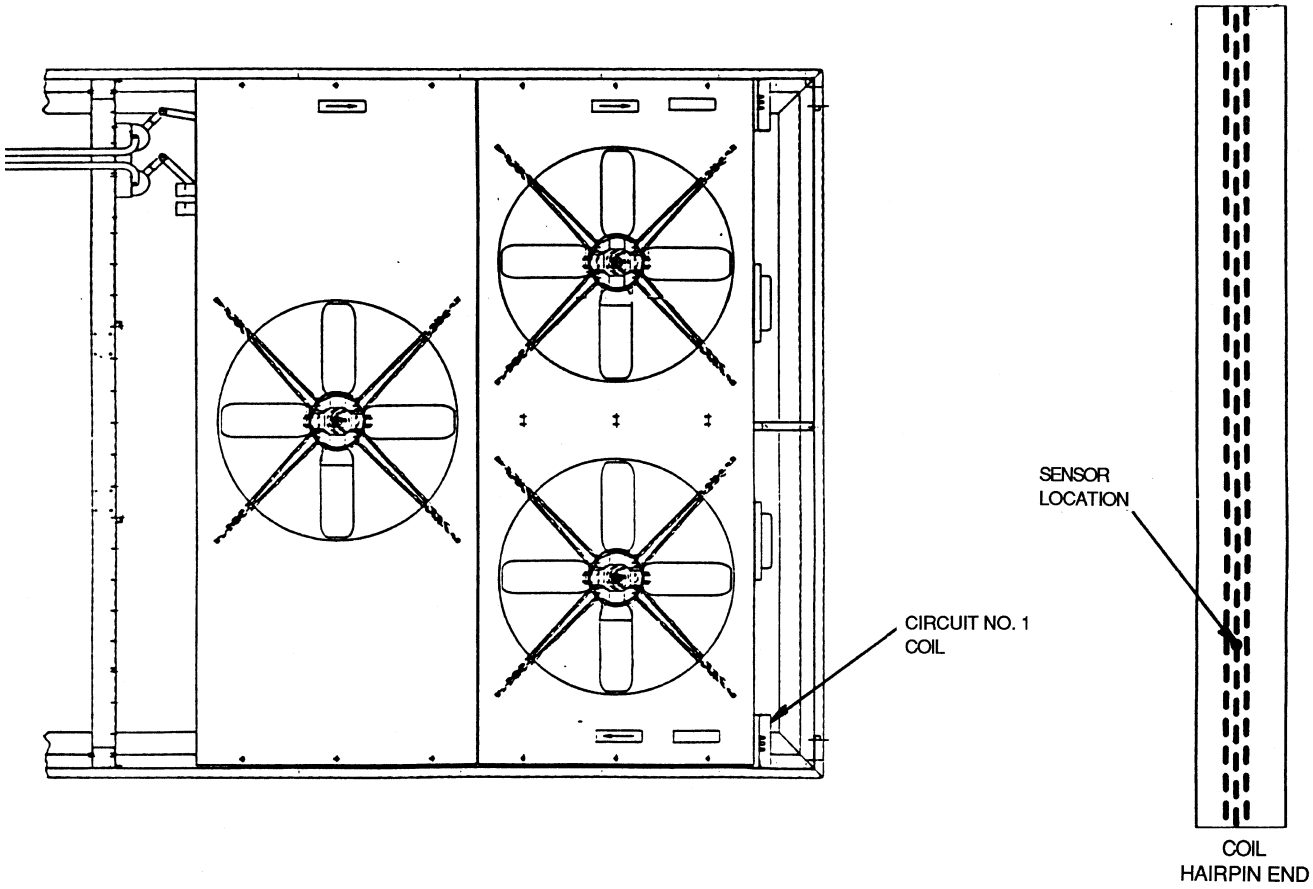


Fig. 61B — Motormaster® I Control Sensor Location, Sizes 040 and 050

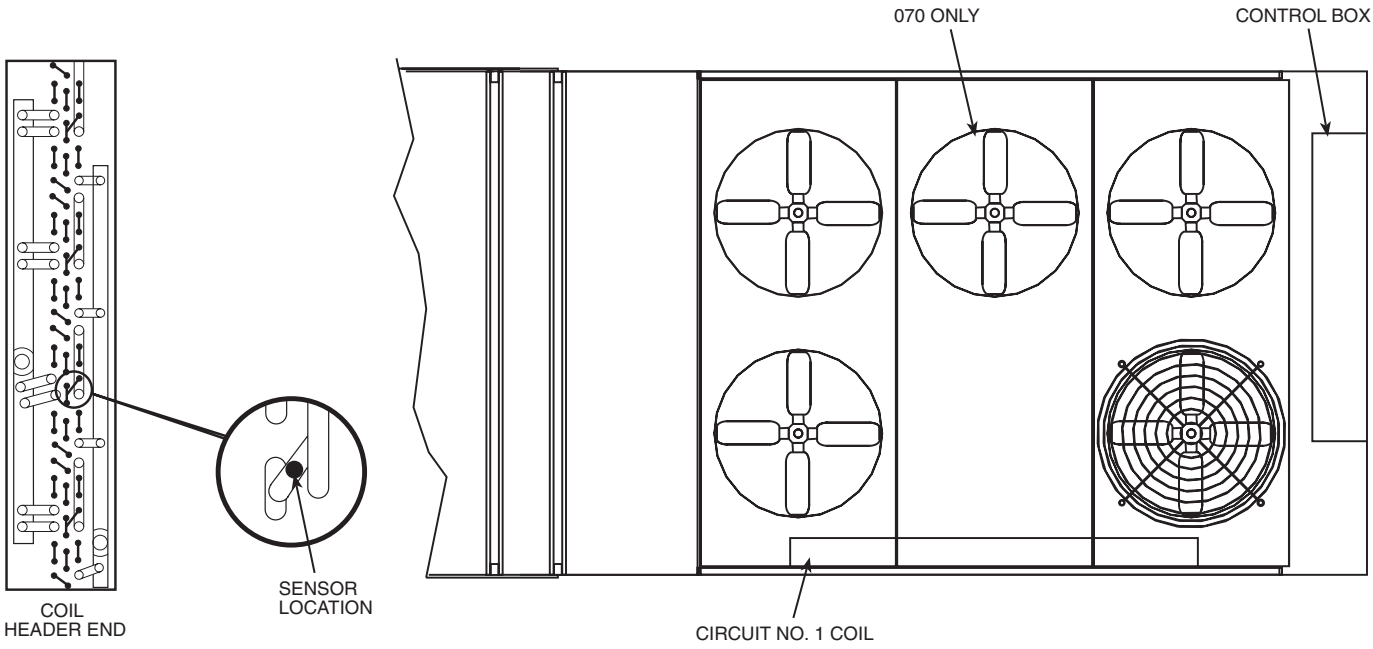


Fig. 61C — Motormaster I Control Sensor Location, Sizes 055-070

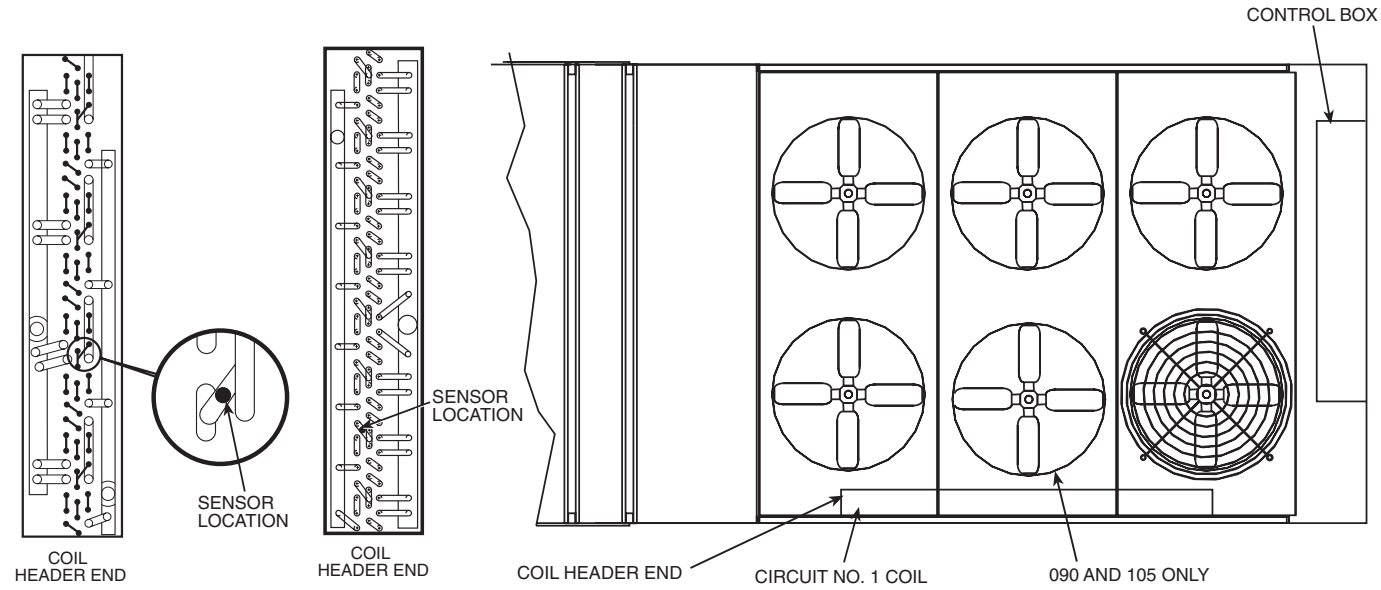


Fig. 61D — Motormaster® I Control Sensor Location, Sizes 075-105

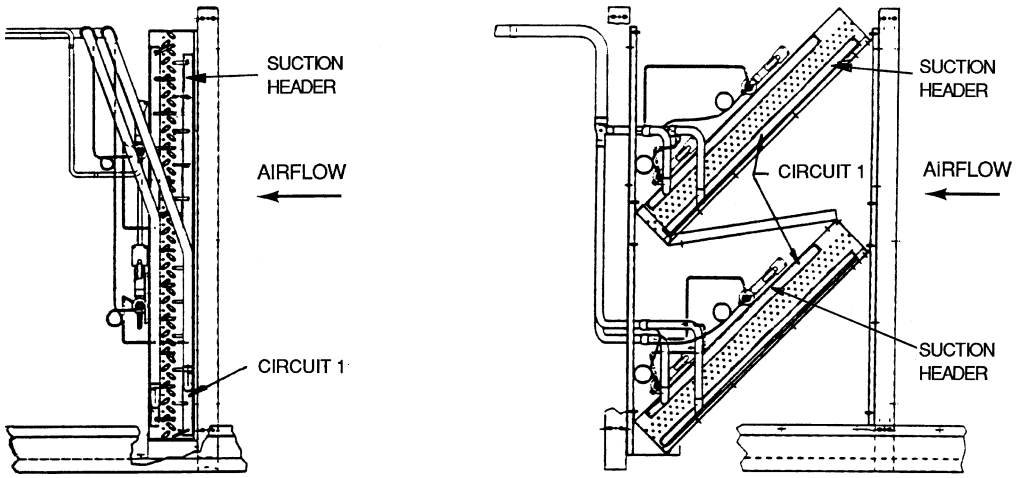
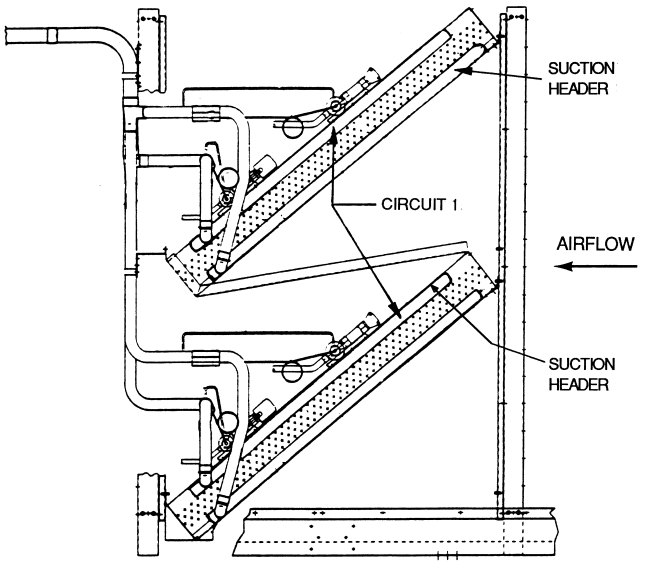


Fig. 62A — Circuit 1 Evaporator Suction Headers for Freeze Protection Thermostat Location, Sizes 030-050



SIZES 055-105

Fig. 62B — Circuit 1 Evaporator Suction Headers For Freeze Protection Thermostat Location, Sizes 055-105

CONTROLS INSTALLATION

Constant Volume Units — The 48ZA,ZC,ZT units may be used in applications with additional control features, options, or accessories. Refer to the appropriate accessory installation instructions for more information on installing that accessory. Control options and accessories available for CV units are:

- Thermostats
- Smoke control modes
- Differential enthalpy sensor
- Modulating power exhaust
- Motormaster® I controller
- Time Guard® II Fan delay
- 115-v convenience outlet
- Pressure operated unloaders

CONTROL WIRING — Install a Carrier-approved accessory 24-v thermostat assembly according to the installation instructions shipped with the accessory. Locate thermostat assembly to sense average temperature. Route thermostat cable or equivalent leads of colored wire from subbase terminals to low voltage terminal board (P1). The low voltage terminal board (P1) is located on the constant volume control board on units without an economizer and on the economizer board on units with the economizer option.

Total wire lengths should not exceed the following limits: 50 ft of 18 AWG (American Wire Gage), 80 ft of 16 AWG or 125 ft of 14 AWG. See Fig. 64 for field wiring connections between the thermostat and the unit 24-v terminal block. Once wire length from unit to thermostat is determined, the length should be doubled to obtain total wire length required. Voltage drop is dependent on length of current path.

There are no required 115-v field wiring connections, therefore no provisions have been made in the unit for running 115-v wiring. If any of the field-installed options requiring 115-v connections are desired, the unit must be modified in the field for 115-v wiring.

Variable Air Volume Units — The 48ZE,ZR,ZV units may be used in applications with additional control features, options, or accessories. Refer to the appropriate accessory installation instructions for more information on installing that accessory. Control options and accessories available for VAV units are:

- Smoke control modes
- Differential enthalpy sensor
- Modulating power exhaust
- Motormaster I controller
- Space temperature reset
- Night setback thermostat (field-supplied)
- Single step demand limit (field-supplied)
- Two-step demand limit
- Inlet guide vanes
- Variable frequency drive
- Variable frequency drive remote display kit

CONTROL WIRING, VARIABLE AIR VOLUME UNITS — A switch or timeclock (field supplied) must be wired in to control when unit will go into and out of Occupied mode. Connect switch or timeclock between terminals 1 and 2 on terminal block 3 (sizes 030-050) or terminal block 4 (sizes 055-105) in unit control box. See Fig. 65. The circuit potential is 24 v.

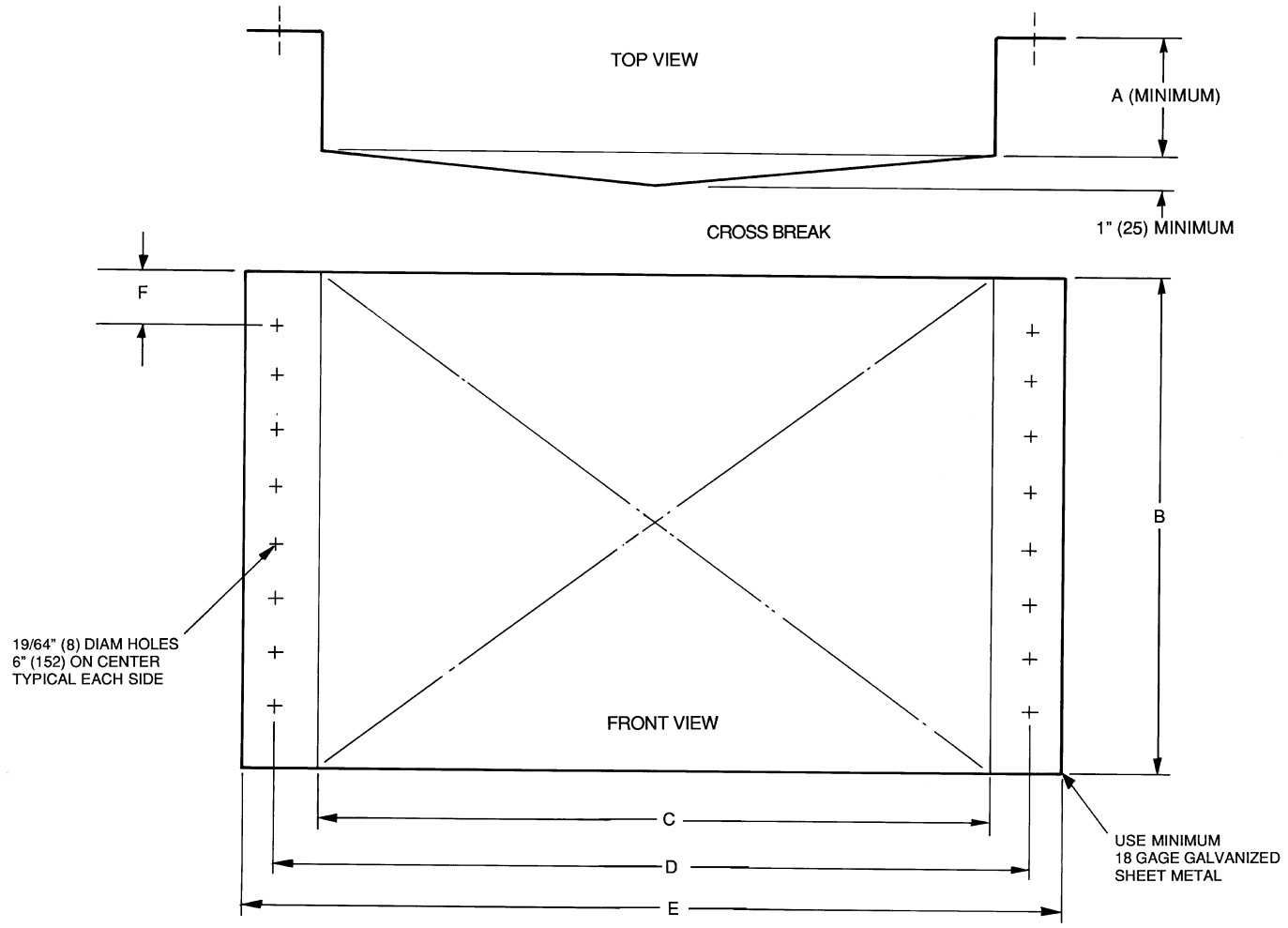
Variable air volume units equipped with warm-up heat require that room terminals be controlled to go fully open when unit goes into the Heating mode. Heating interlock relay (HIR) is provided for this function. The relay is located in the unit control box. When unit goes into Heating mode, heating interlock relay is energized providing switch closure or opening (depending on how field power source is set up) to open the room terminals. Field connections for interlock relays are terminals 3 and 4 (for normally open contacts) and terminals 3 and 7 (for normally closed contacts) on terminal block 3 (sizes 030-050) or terminal block 4 (sizes 055-105). See Fig. 66. Note that a field-supplied power source is required.

There are no required 115-volt field wiring connections, therefore no provisions have been made in the unit for running 115-volt wiring. If any of the field-installed options requiring 115-volt connections are desired, the unit must be modified in the field for 115-volt wiring. Options requiring 24-volt or 115-volt control wiring are shown in Fig. 67-70.

Night Setback Thermostat — Wire field-supplied thermostat (suitable for 24-v circuit) between terminals 1 and 2 on terminal block 3 (sizes 030-050) or terminal block 4 (sizes 055-105). This thermostat is used to bypass the timeclock occupied/unoccupied switch and is used to operate unit during unoccupied times at more economical temperatures. (See Fig. 65.)

Space Temperature Reset Accessory (50DJ900021) — Consists of a thermistor (T10) and a reset board with a potentiometer (P7) that is used to set space temperature at which reset starts. Mount reset board in unit control box or other convenient place. Wire thermistor in series with P7 and connect to terminals 12 and 15 on terminal block 3 (sizes 030-050) or terminal block 4 (sizes 055-105) in unit control box. If there is a long run to conditioned space, it is necessary to splice additional wire to thermistor. The reset board has 2 pressure connectors for field wiring. (See Fig. 67).

Single-Step Demand Limit Potentiometer — Potentiometer is a field-supplied, 3-wire potentiometer with a resistance of 5-K to 20-K ohms. Connect 3 wires from potentiometer to terminals 8, 9 and 10 on terminal block 3 (sizes 030-050) or terminal block 4 (sizes 055-105) in unit control box, as shown in Fig. 68.



NOTES:
1. Dimensions shown in ( ) are in millimeters.
2. Two baffles are required per unit.

UNIT SIZES 48Z	DIMENSIONS											
	A		B		C		D		E		F	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
030,035	10	254	59	1500	44	1118	45 1/2	1156	47 1/2	1207	2	51
040,050	10	254	59	1500	59	1500	60 1/2	1537	62 1/2	1588	2	51
055,060	10	254	31	787	72	1829	73 3/4	1873	75 3/4	1924	1	25
070-105	10	254	31	787	108	2743	109 1/2	2781	111 1/2	2832	1	25

Fig. 63 — Wind Baffle Mounting Details

Accessory 2-Step Demand Limit (32GB400274) (Fig. 69) — Install the 2-step demand limit module in unit control box as close as possible to the processor board. Mount using four no. 8 x 3/4-in. long screws.

24-Volt Connection — The 2-step demand limit module is equipped with a connector for hookup to processor board. Prior to hookup, plugs and wires running between terminals 1, 2 and 3 on J3 of the processor board and terminals 1, 2 and 3 on terminal block 3 in unit control box must be removed. After removing these plugs, attach connector from demand limit module to terminals 1, 2 and 3 on processor board. The 115-volt wiring for field-controlled input signals must be completed before demand limit board will operate.

115-Volt Connection — Field-controlled input signals to the accessory 2-step demand limit module. Connect field input signals to terminal strips INT1 and INT2 located on the module (see Fig. 69). These are pressure-type terminals. The terminals will accept up to 12-gage wire. See Fig. 70 for wiring details.

Variable Frequency Drive (VFD) — The VFD factory-installed option is available only on 48ZE,ZJ,ZL,ZR,ZV,ZW units. The VFD is factory-wired and is factory-configured with the proper program and jumpers for each unit.

Refer to the separate Controls and Troubleshooting manuals for instructions on adjusting set points and servicing the VFD.

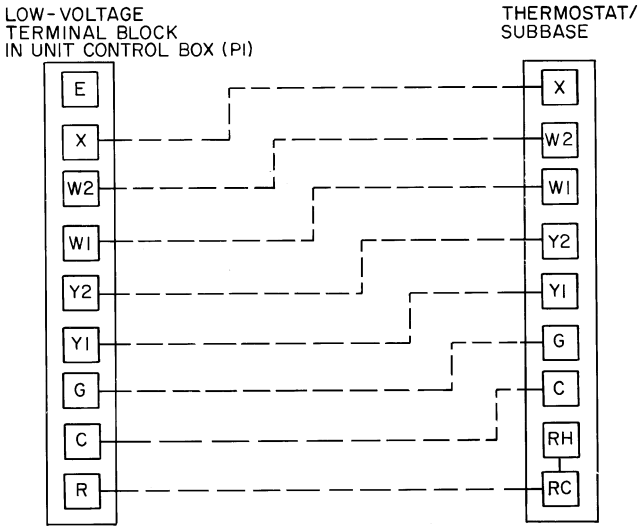
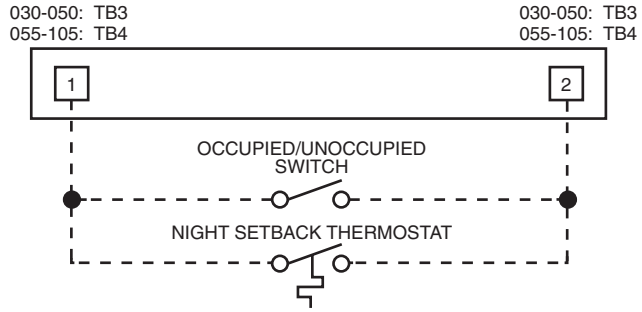


Fig. 64 — Field Control Thermostat Wiring



NOTES:
1. Occ/Unocc switch to closes when occupied.
2. Night setback thermostat closes when in night setback heating.

Fig. 65 — Occupied/Unoccupied Switch with Night Setback Thermostat

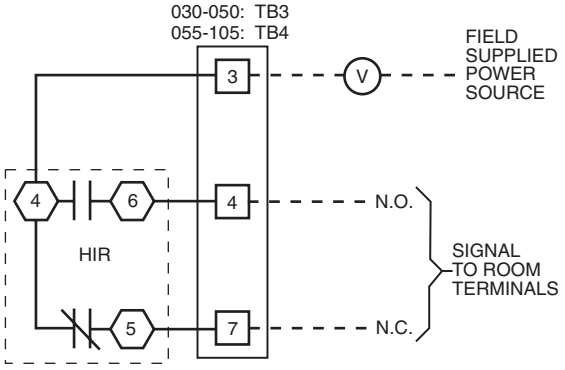


Fig. 66 — Heat Interlock Relay (Variable Air Volume Units)

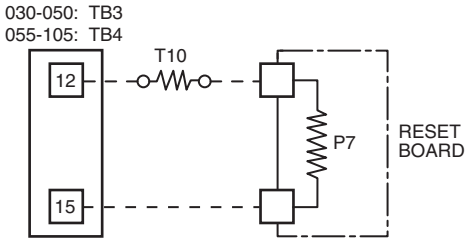


Fig. 67 — Accessory Reset Board

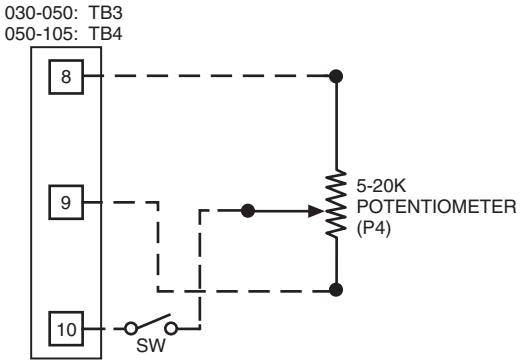
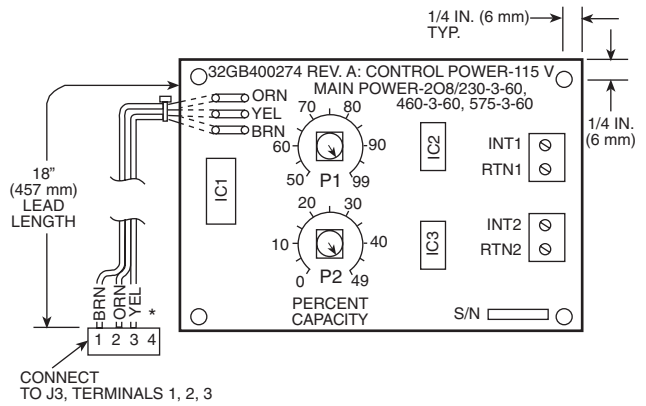


Fig. 68 — Single Step Demand Limit

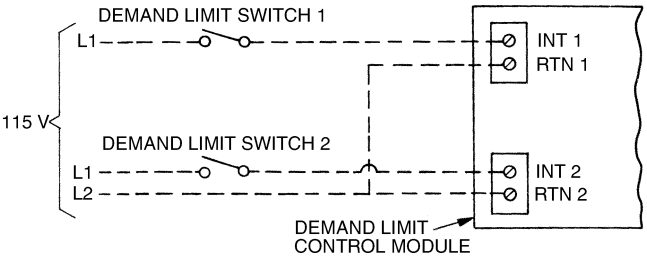


LEGEND

INT — Input Terminal
RTN — Return Terminal

*Connector wiring must be as shown.

Fig. 69 — Two-Step Demand Limit Module Details



NOTES:
1. Demand limit switches are field supplied and wired.
2. Demand limit control module terminal blocks will accept up to 12-gage wire.
3. ▬▬ is field wiring.

Fig. 70 — Two-Step Demand Limit Module Details

PIC Control Wiring — See Fig. 71 for space temperature sensor connections to main and auxiliary control boxes. The recommended types of control wiring for 48ZJ,ZL,ZW unit devices are shown below:

MANUFACTURER	PART NO.	
	Regular Wiring	Plenum Wiring
Alpha	1895	—
American	A21451	A48301
Belden	8205	884421
Columbia	D6451	—
Manhattan	M13402	M64430
Quabik	6130	—

SENSORS — Sensors should be wired using single twisted pairs of 20 AWG (American Wire Gage) conductor cable rated for the application, except for the T-56 accessory sensor which requires 3-conductor cable.

NOTE: Humidity and CO_2 sensors must be powered from a separate isolated 24-v power supplies.

HUMIDITY CONTROL AND HOT WATER AND STEAM VALVES — These devices require 20 AWG twisted pair conductor cables rated for the application for the 4 to 20 mA signal.

SPACE TEMPERATURE SENSOR (T-55) — The space temperature sensor (P/N CEC0121448-01) is shipped standard with every unit, and is located in the main control box. Space temperature sensor wires are to be connected to terminals in the unit main control box. The space temperature sensor includes a terminal block (TB1), a jumper between pins E2 and E3, and an RJ11 female connector. The RJ11 connector is used to tap into the Carrier Comfort Network (CCN) at the sensor. See RJ11 Plug Wiring section on page 73 to connect the RJ11 connector to the CCN. A 3-lead cable must run from the RJ11 connector to the unit for communication through the sensor.

⚠ CAUTION

Jumper **MUST** be in place between pins E2 and E3 or inaccurate readings could result.

To connect the space temperature sensor (Fig. 71):

1. Connect 1 wire of the twisted pair to terminal T1 (T-55) and connect the other wire to terminal T2 on terminal block 1 (TB1) located on the cover of the space temperature sensor using a 20 AWG twisted pair conductor cable rated for the application.
2. Connect the other ends of the wires to terminals 1 and 3 on TB3 (030-050) or 1 and 2 on TB2 (055-105) respectively located in the unit main control box.

NOTE: This sensor should be installed for all applications. For VAV applications, it is used to control heating and cooling during unoccupied periods. For DAV (digital air volume) applications, it is used to maintain control of the space during linkage failures with the TSM (terminal system manager).

NOTE: Either the T-55 or T-56 sensor must be connected for CV (constant volume) applications to function properly.

SPACE TEMPERATURE SENSOR (T-56) (CV Applications Only) — Space temperature sensor (P/N CEC0121503-01) wires are to be connected to terminals in the unit main control box. The space temperature sensor includes a terminal block (TB1), a jumper between pins E2 and E3, and an RJ11 female connector. The RJ11 connector is used to tap into the CCN at the sensor. See RJ11 Plug Wiring section on page 73 to connect the RJ11 connector to the CCN.

⚠ CAUTION

Jumper MUST be in place between pins E2 and E3 or inaccurate readings could result.

To connect the space temperature sensor (Fig. 71):

1. Connect one wire of the 3-conductor cable to terminal TH, one wire to terminal COM, and the other wire to terminal SW on terminal block 1 (TB1) located on the cover of the space temperature sensor using a 20 AWG twisted 3-conductor cable rated for the application.
2. Connect the other ends of the wires to terminals 1, 3, and 7 on TB3 (030-050) or terminals 1, 2, and 7 on TB2 (055-070) respectively located in the unit main control box. The wire from terminal SW MUST be connected to terminal 7.

NOTE: Either the T-55 or the T-56 sensor must be connected for CV applications to function properly.

SPACE TEMPERATURE AVERAGING — Applications that require averaging using multiple space temperature sensors can be satisfied using either 4 or 9 sensors as shown in Fig. 72.

NOTE: Only Carrier sensors may be used for standard T-55 space averaging. Sensors must be used in multiples of 1, 4, or 9 only, with total sensors wiring not to exceed 1000 ft. However, space temperature reset can be accomplished with only one sensor.

NOTE: Do not use T-56 sensors for space temperature averaging because the 5-degree offset function will not work in a multiple sensor application.

HEAT INTERLOCK RELAY (VAV Units Only) — Not Necessary For Digital Air Volume Applications) — Variable air volume (VAV) units using optimal start (morning warm-up) and/or occupied heating require that room terminals be controlled to the fully open position when the unit goes into Heating mode. The HIR1 (Heat Interlock Relay) function is provided for this control. When the unit goes into Heating mode, the HIR is energized to provide switch closure or opening (depending on how the field-supplied power source is set up) to open the room terminals. The field connections for the HIR are at TB3 (030-050) or TB2 (055-105). Refer to Table 18 and Fig. 73.

OPTION AND ACCESSORY CONTROL WIRING — The 48ZJ,ZL,ZW units may be used in applications with additional control features, options, or accessories. Refer to the Controls and Troubleshooting manual for more information concerning installation and configuration of options and accessories. Figures 73-86 contain wiring information on the following features:

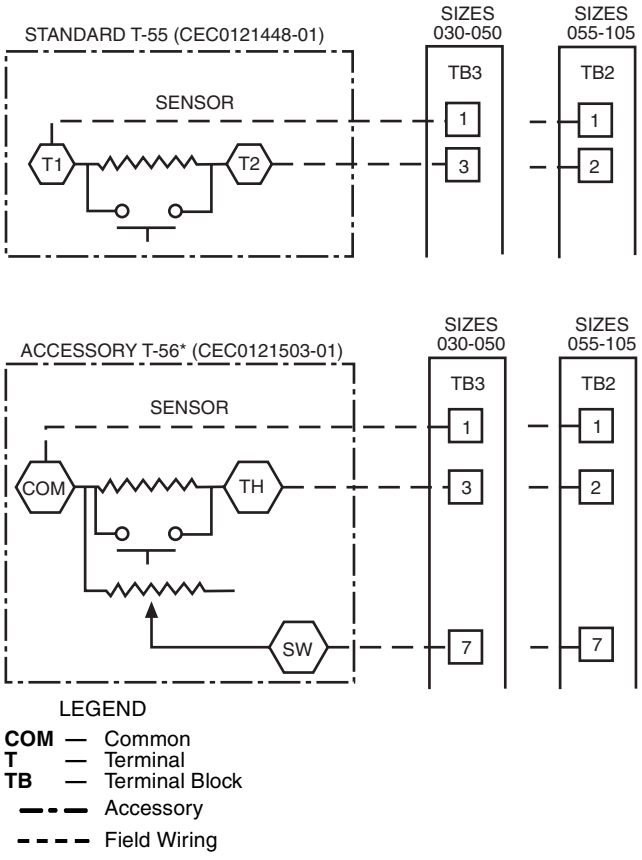
- Heat interlock relay (Fig. 73)
- Differential enthalpy sensor (Fig. 74)
- Remote start (Fig. 75)
- Accessory humidity control (Fig. 76)
- Smoke control (Fig. 77)
- Indoor air quality (Fig. 78)
- Outdoor airflow control (Fig. 79)
- Timed discrete output (Fig. 80)
- Humidifier (Fig. 81)
- Hydronic heating (Fig. 82)
- Freezestat (Fig. 83)
- Remote supply-air temperature/space temperature offset (Fig. 84)
- Refrigerant transducer/thermistor (Fig. 85)
- CCN Building Supervisor (Fig. 86)

REMOTE START — The 48ZJ,ZL units have the ability to be able to be started remotely through a discrete 24 VAC input to Channel 49, DSIO2, plug J3 terminals 1 and 2. See Fig. 75. A separate field-supplied, field-installed transformer is required. The 24 VAC input can then be switched with a timeclock or other set of contacts.

The use of the 24 VAC input can also be used to take the unit out of standby. However, once taken out of standby, the unit cannot be put back into standby by simply removing the 24 VAC power supply. The use of the HSIO is necessary to put the unit back into standby.

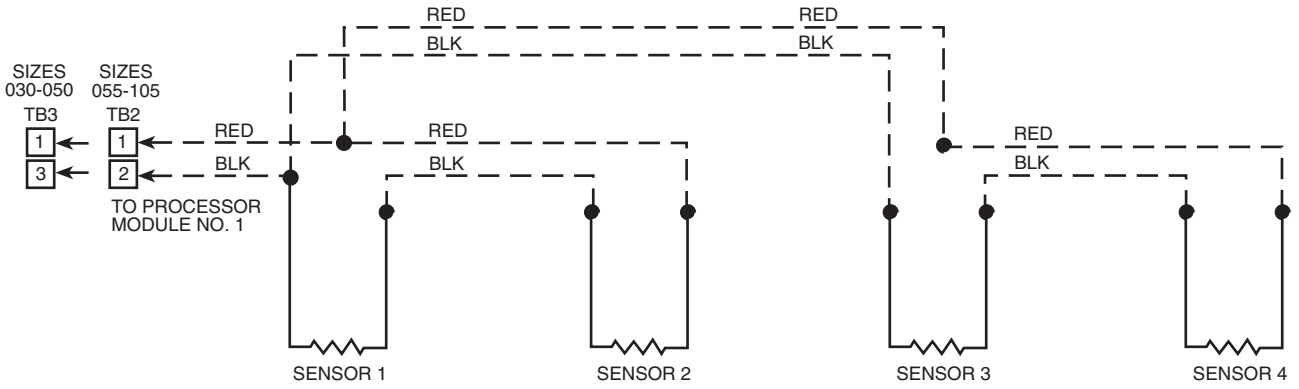
Table 18 — Field Connections for HIR1

HEAT INTERLOCK RELAY	TERMINALS	
	Sizes 030-050	Sizes 055-105
Normally Closed	2 and 4	8 and 10
Normally Open	4 and 5	8 and 9

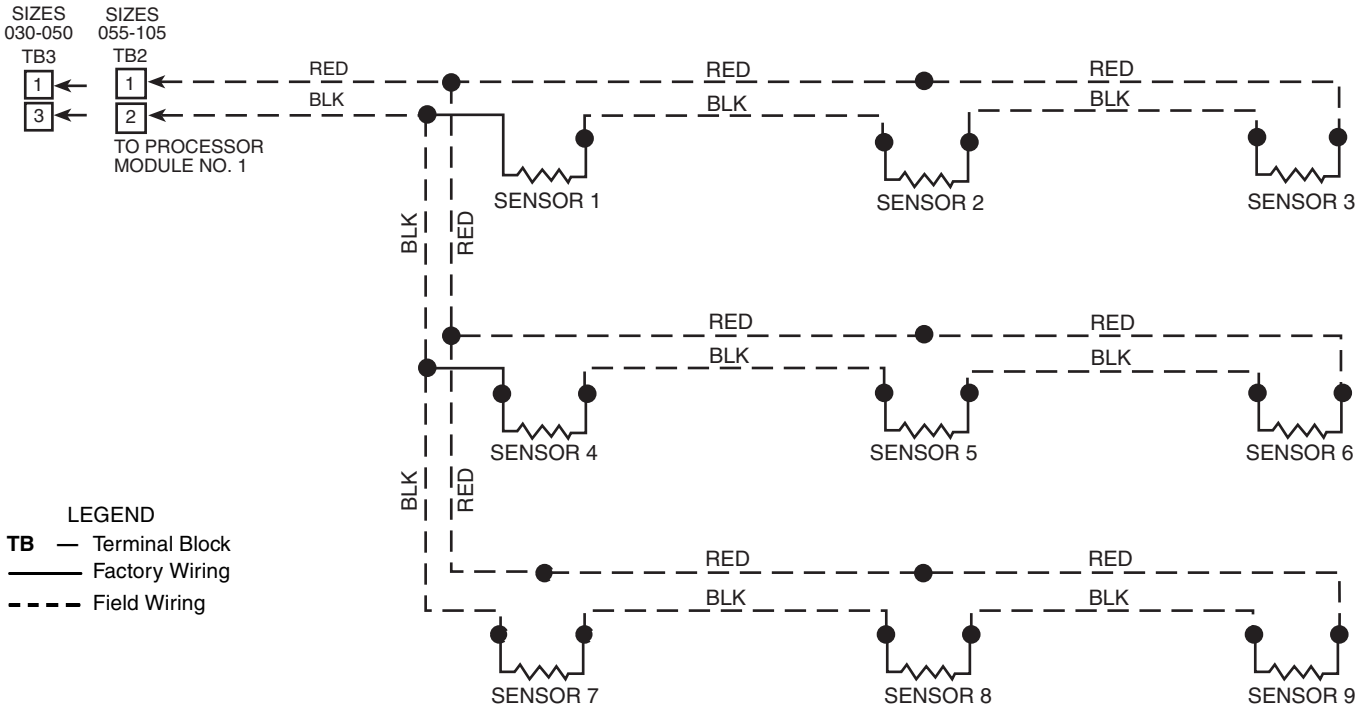


*Constant volume applications only.

Fig. 71 — Space Temperature Sensor Wiring



SPACE TEMPERATURE AVERAGING — 4 SENSOR APPLICATION



SPACE TEMPERATURE AVERAGING — 9 SENSOR APPLICATION

Fig. 72 — Space Temperature Sensor Averaging

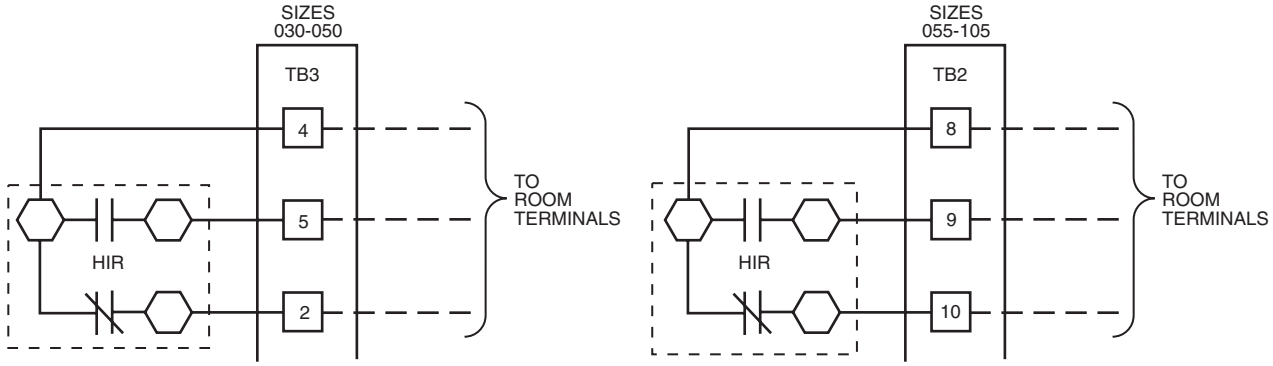


Fig. 73 — Heat Interlock Relay Wiring (PIC Control Units)

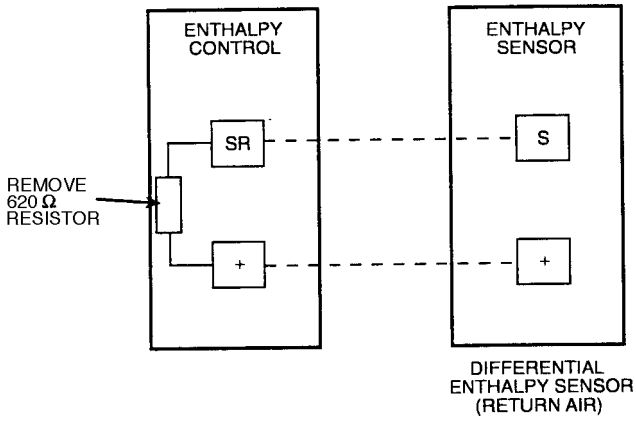


Fig. 74 — Differential Enthalpy Sensor

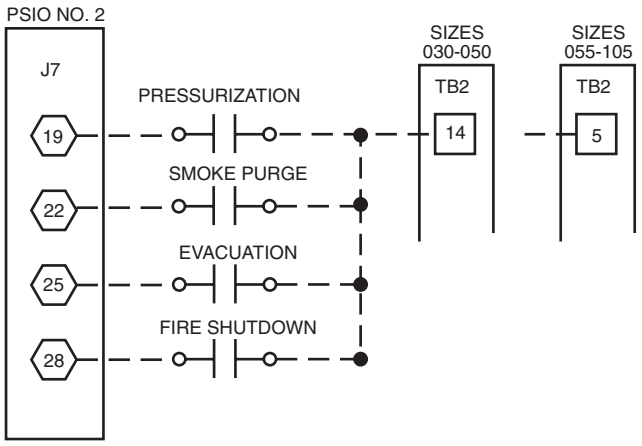
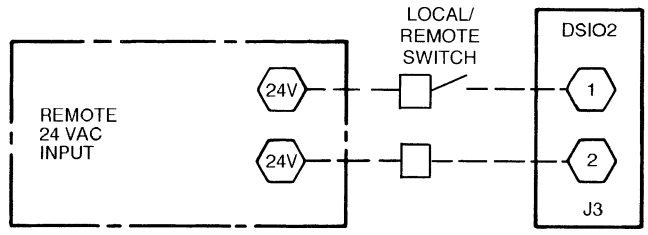


Fig. 77 — Smoke Control



LEGEND

DSIO — Discrete Sensor Input/Output Module

Fig. 75 — Remote Start

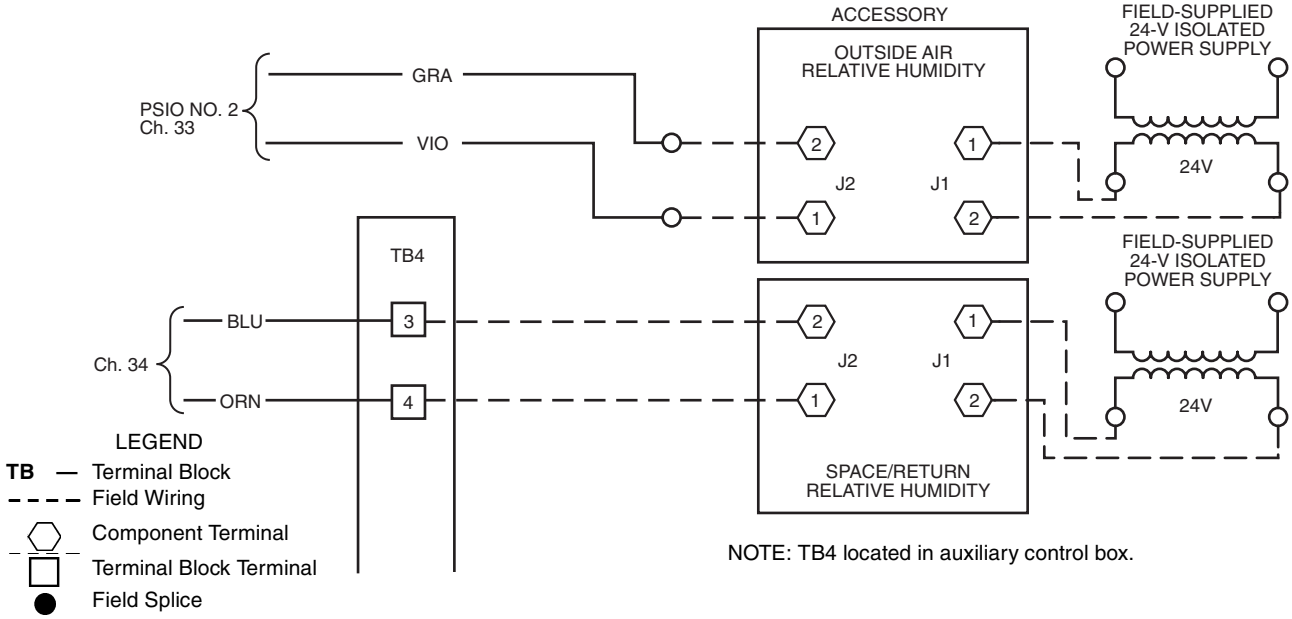
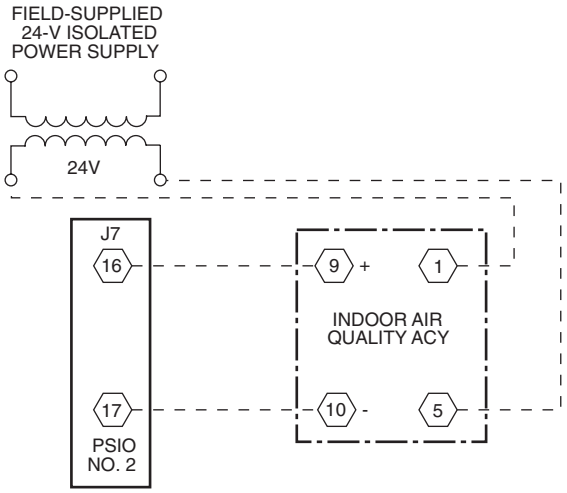


Fig. 76 — Accessory Humidity Control

CGCDXSEN001A00, CGCDXSEN002A00,
CGCDXSEN003A00



33ZCSENCO2

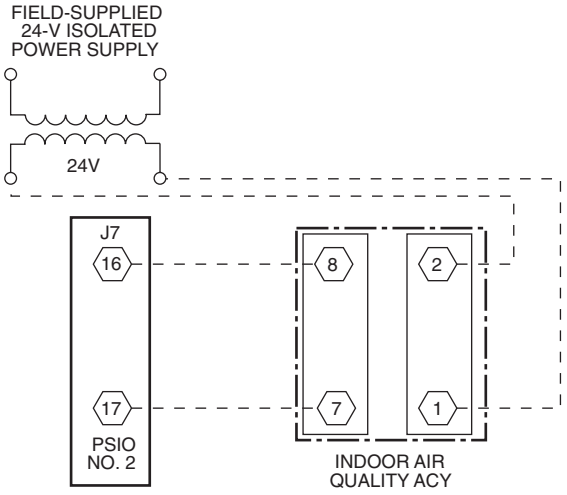


Fig. 78 — Indoor-Air Quality

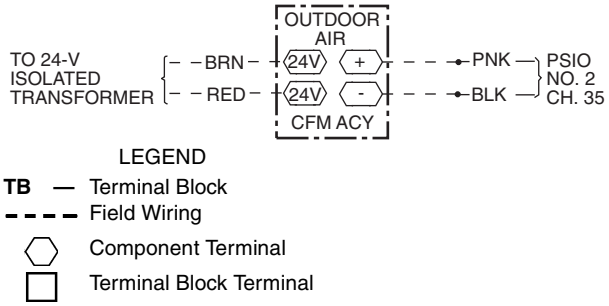


Fig. 79 — Outdoor Airflow Control

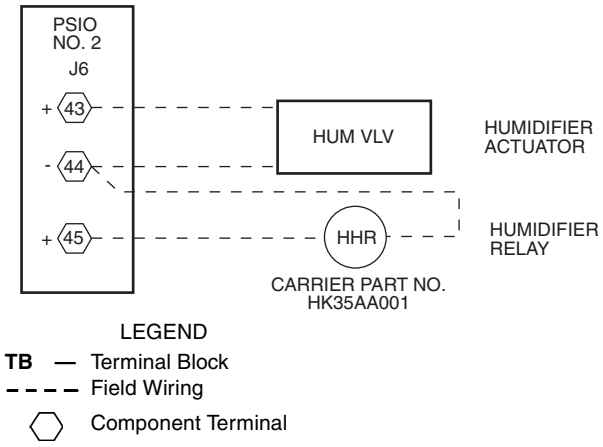


Fig. 81 — Humidifier

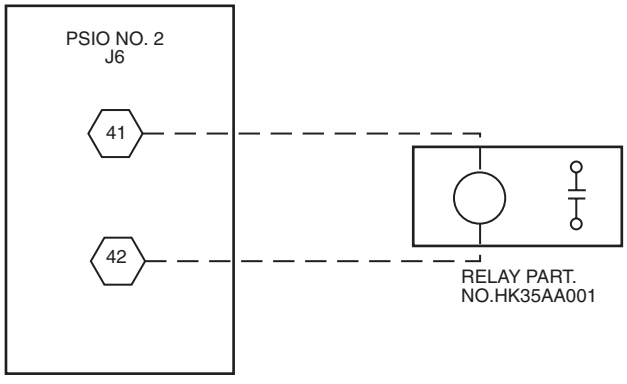


Fig. 80 — Timed Discrete Output

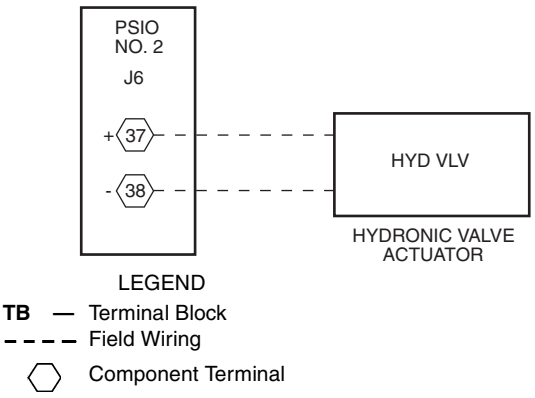


Fig. 82 — Hydronic Heating

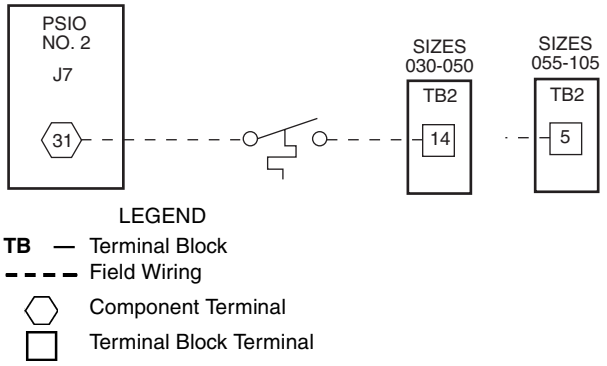


Fig. 83 — Freezestat

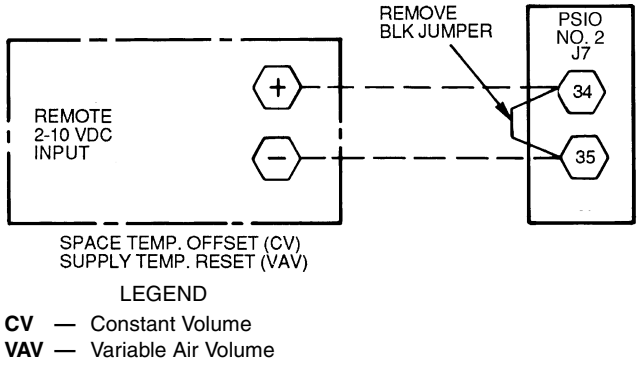


Fig. 84 — Remote Supply Air Temperature Reset/Space Temperature Offset

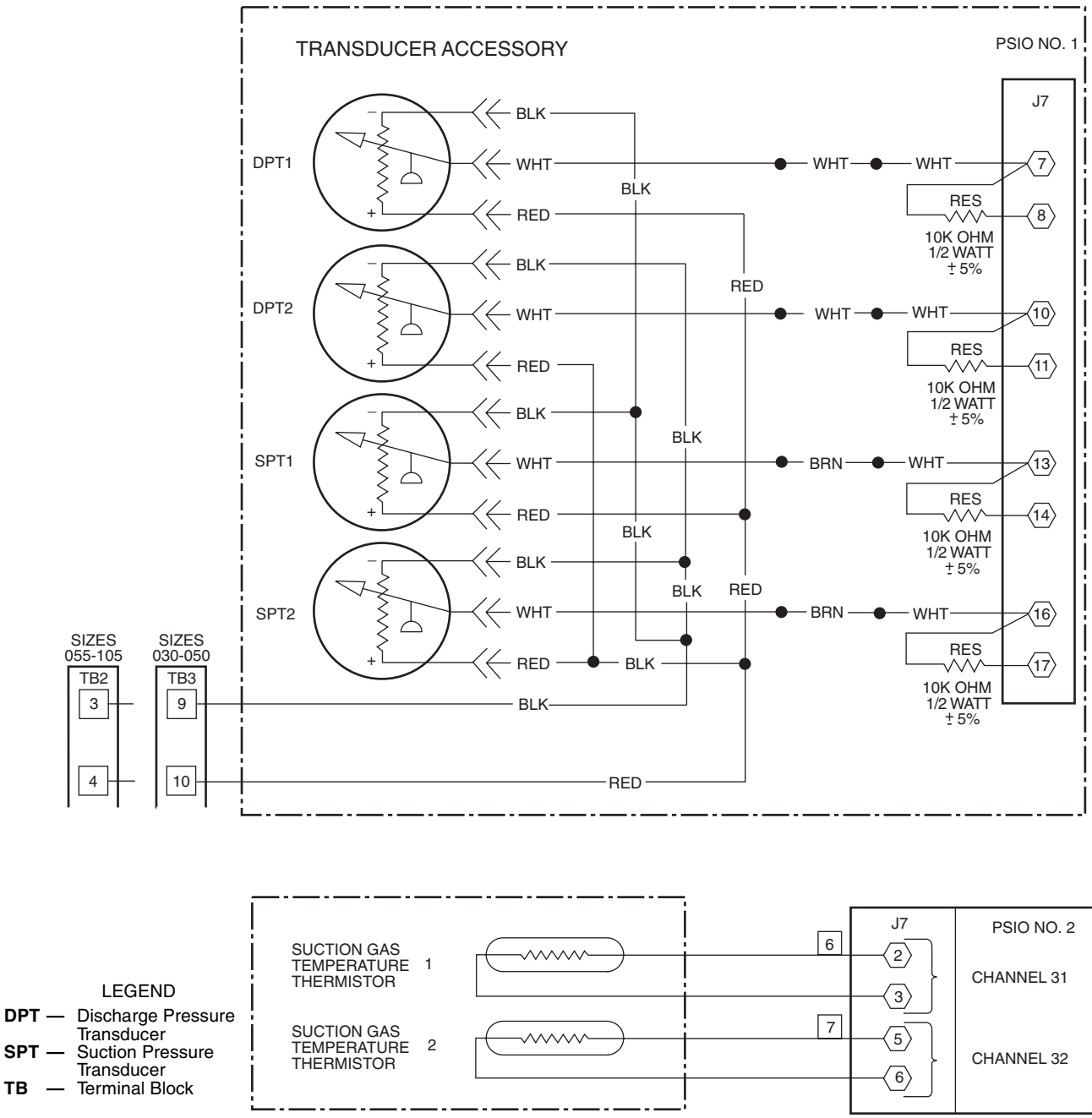


Fig. 85 — Refrigerant Transducer/Thermistor

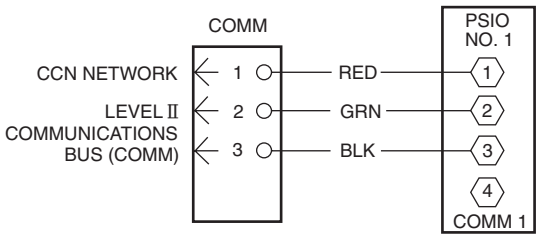


Fig. 86 — CCN Building Supervisor

Supply-Air Thermistors (Staged Gas Units Only) — Supply-air thermistors are a field-installed, factory-provided component. Three supply-air thermistors are shipped with staged gas units inside the heating section. Thermistor wires must be connected to SGC in the heating section. See Table 19. The supply-air thermistors should be located in the supply duct with the following criteria:

- downstream of the heat exchanger cells
- equally spaced as far as possible from the heat exchanger cells
- a duct location where none of the supply air thermistors are within sight of the heat exchanger cells
- a duct location with good mixed supply air portion of the unit.

Carrier Comfort Network (CCN) Interface — The 48ZJ,ZL units can be connected to the CCN if desired. The communication bus wiring is supplied and installed in the field. It consists of shielded, 3-conductor cable with drain wire.

The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system element on either side of it, the negative pins must be wired to the negative pins, and the signal pins must be wired to signal ground pins. Wiring connections for CCN should be made at the 4-pin plug (COMM) located at the bottom right side of the fuse bracket in the main control box. Consult CCN Contractor's Manual for further information.

NOTE: Conductors and drain wire must be 20 AWG minimum stranded, tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of –4 to 140 F (–20 to 60 C) is required. See table below for cables that meet the requirements.

MANUFACTURER	CABLE PART NO.
Alpha	2413 or 5463
American	A22503
Belden	8772
Columbia	02525

IMPORTANT: When connecting the CCN communication bus to a system element, use a color coding system for the entire network to simplify installation and checkout.

The following color code is recommended:

SIGNAL TYPE	CCN BUS CONDUCTOR INSULATION COLOR	COMM1 PLUG PIN NO.
+	RED	1
GROUND	WHITE	2
–	BLACK	3

NOTE: If a cable with a different color scheme is selected, a similar color code should be adopted for the entire network.

At each system element, the shields of its communication bus cables must be tied together. If the communication bus is entirely within one building, the resulting continuous field must be connected to a ground at one point only. If the communication bus cable exits from one building and enters another, the shields must be connected to grounds at the lightning suppressor in each building where the cable enters or exits the building (one point per building only).

To connect the unit to the network (see Fig. 87):

1. Turn off power to the control box.
2. Cut the CCN wire and strip the ends of the red (+), white (ground) and black (–) conductors. (If a different network color scheme is used, substitute appropriate colors.)
3. Remove the 4-pin female plug from the fuse and control circuit breaker bracket in the main control box, and connect the wires as follows:
   a. Insert and secure the red (+) wire to terminal 1 of the 4-pin plug.
   b. Insert and secure the white (ground) wire to terminal 2 of the 4-pin plug.
   c. Insert and secure the black (–) wire to terminal 3 of the 4-pin plug.
4. Insert the plug into the existing 4-pin mating connector on the fuse or control circuit breaker bracket in the main control box.

IMPORTANT: A shorted CCN bus cable will prevent some routines from running and may prevent unit from starting. If abnormal conditions occur, unplug the connector. If conditions return to normal, check CCN connector, and run new cable if necessary. A short in one section of the bus can cause problems with all system elements on the bus.

Table 19 — SGC Thermistor Designations

THERMISTOR	PIN CONNECTION POINT	FUNCTION AND LOCATION	PART NO.
		Thermistors	
SAT1	J8 – 1,2 (SGC)	Supply-Air Thermistor (SAT) — Inserted into supply section underneath the gas heat section (factory-provided, field-installed)	HH79NZ033
SAT2	J8 – 3,4 (SGC)	Supply-Air Thermistor (SAT) — Inserted into supply section underneath the gas heat section (factory-provided, field-installed)	
SAT3	J8 – 5,6 (SGC)	Supply-Air Thermistor (SAT) — Inserted into supply section underneath the gas heat section (factory-provided, field-installed)	
LIMTTEMP	J8 – 15,16 (SGC)	Limit Switch Thermistor (LIMTTEMP) — Inserted next the lower limit switch (factory-installed)	

RJ11 PLUG WIRING — Units on the CCN can be monitored from the space at the sensor through the RJ11 connector, if desired. To wire the RJ11 connector into the CCN (Fig. 87):

IMPORTANT: The cable selected for the RJ11 connector wiring MUST be identical to the CCN communication bus wire used for the entire network.

1. Cut the CCN wire and strip ends of the red (+), white (ground), and black (–) conductors. (If another wire color scheme is used, strip ends of appropriate wires.)
2. Insert and secure the red (+) wire to pin J2 of the space temperature sensor terminal block (TB1).
3. Insert and secure the white (ground) wire to pin J3 of the space temperature sensor TB1.
4. Insert and secure the black (–) wire to pin J5 of the space temperature sensor TB1.
5. Connect the other end of the communication bus cable to the remainder of the CCN communication bus at the COMM1 plug located on the fuse and control circuit breaker bracket in the unit main control box.

Smoke Control Modes — Rooftop units can be used for aid in building smoke control in the event of a building fire. The available functions include: Fire Shutdown, Pressurization, Evacuation, and Smoke Purge. These functions are enhanced when multiple rooftop units are used to zone a building. See Table 20.

FIRE SHUTDOWN — Fire Shutdown mode terminates all unit operation (cooling, heating, supply fan, and power exhaust). This mode prevents recirculation of contaminated air back into the space. The mode will not allow admission into the space of unsuitable outside air.

PRESSURIZATION — Pressurization mode is intended to keep smoke out of a zone. The factory-installed optional economizer is required for this function. Pressurization is accomplished by the following:

- opening the economizer (option)
- running the supply fan (optional inlet guide vanes open or optional VFD at normal duct static pressure set point)
- closing the power exhaust dampers (if installed as option or accessory)
- shutting off the power exhaust fans (if installed as option or accessory)

This allows the space to be overpressurized relative to adjacent zones and prevents or slows entry of smoke into this space from adjacent zones.

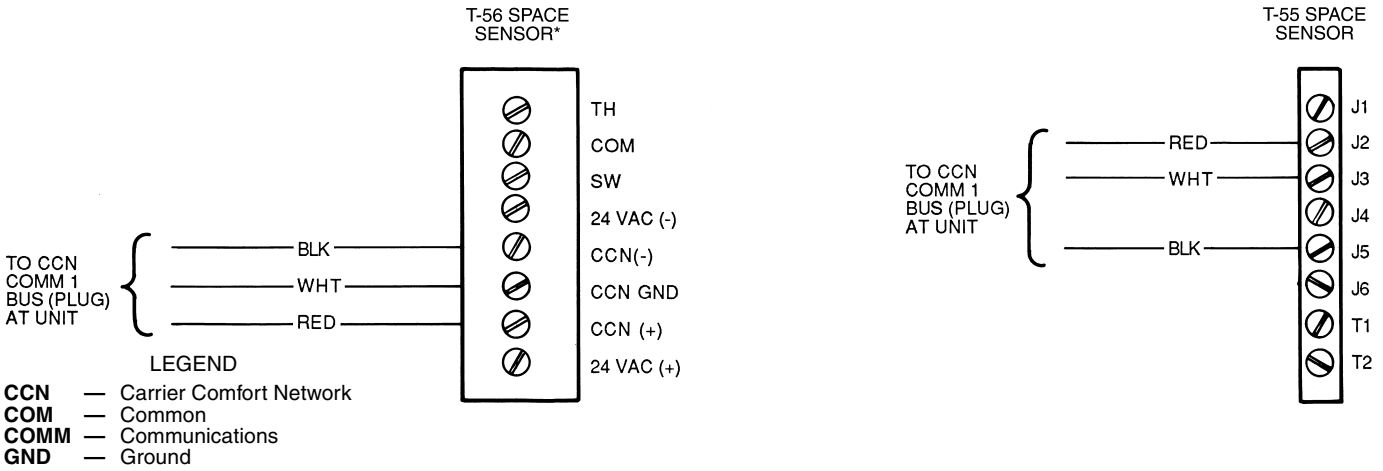
EVACUATION — Evacuation mode removes smoke or undesirable air from interior spaces without reintroducing unsuitable air. The factory-installed optional economizer with option/accessory power exhaust is required for this function. Evacuation is accomplished by the following:

- turning the supply fan off
- opening the economizer (option required)
- running the exhaust fans (option or accessory required)
- opening the exhaust dampers.

SMOKE PURGE — Smoke Purge mode removes smoke from the interior spaces and replaces it with fresh outside air. The factory-installed optional economizer with option/accessory power exhaust is required for this function. Smoke purge is accomplished by the following:

- turning supply fan on
- opening the economizer (option required)
- running the exhaust fans (option or accessory required)
- opening the exhaust dampers

SMOKE CONTROL INSTALLATION — Implementation of the various Smoke Control Modes on these units requires the installer to modify the unit wiring to add contacts (via either manual switches or relays) that will selectively interrupt and override standard factory control sequences. See Tables 21-26 and Fig. 88-92 for more information.



*Constant Volume Application Only.

Fig. 87 — Space Sensor to Communication Bus Wiring

Table 20 — Smoke Control Modes

FUNCTION	MODE			
	Fire Shutdown	Pressurization	Evacuation*	Smoke Purge*
Supply Fan	Off	On	Off	On
IGV/VFD†	—	Open/On	—	Open/On
Economizer	Closed	Open	Open	Open
Return-Air Damper	Open	Closed	Closed	Closed
Exhaust Fans	Off	Off	On	On
Exhaust Damper	Closed	Closed	Open	Open

LEGEND

IGV — Inlet Guide Vanes
PIC — Product Integrated Controls
VAV — Variable Air Volume
VFD — Variable Frequency Drive

*Power exhaust option required for this mode.
†Applicable to VAV and PIC units with appropriate options.

Table 21 — Smoke Control Switches — Constant Volume Units (48ZA,ZC,ZT)

SMOKE CONTROL MODE	FIRE SHUTDOWN	PRESSURIZATION	EVACUATION (Non-Modulating Power Exhaust)	EVACUATION (Modulating Power Exhaust)	SMOKE PURGE
SWITCHES USED	SW-1	SW-1	SW-1	SW-1	SW-1
	SW-2	SW-2	SW-2	SW-2	SW-2
		SW-3	SW-3	SW-3	SW-3
		SW-4	SW-4	SW-4	SW-4
		SW-5A/B	SW-6	SW-6	SW-5A/B
		SW-6	SW-7	SW-7	SW-8
				SW-8	
				SW-9	

NOTE: All switches are shown in “as installed” (power OFF or deenergized) position. In these positions, none of these modes will be activated and normal unit operation is permitted by the base unit controls. To initiate any mode, all switches listed under this mode in the table must be energized, causing the contact position to change to energized position. Switches may be manually or electrically operated.

Table 22 — Smoke Control Switch Functions — Constant Volume Units (48ZA,ZC,ZT)

SWITCH NUMBER	CONFIGURATION	VOLTAGE	FUNCTION
SW-1	N.C.	115	Disconnect 115-v Control Power
SW-2	N.C.	24	Disconnect 24-v Control Power
SW-3	N.O.	24	Supply Power to Economizer Motor
SW-4	N.C.	24	Opens Economizer Dampers to Wide-Open
SW-5A/B	A: N.C. B: N.O.	115	A. Prevent Backfeed through K3 B: Energize IFC
SW-6	N.C.	115	Isolate IFC and PEC, for Separate Operation
SW-7	N.O.	115	Energize Power Exhaust
SW-8	N.O.	24	Force Power Exhaust Damper for Open
SW-9	N.C.	24	Prevent DPS or BPS (48ZC Units Only) Control from Reclosing Exhaust Damper Due to Low BP

LEGEND

BP — Building Pressure
BPS — Building Pressure Switch
DPS — Differential Pressure Switch
IFC — Indoor Fan Contactor
N.C. — Normally Closed
N.O. — Normally Open
PEC — Power Exhaust Contactor

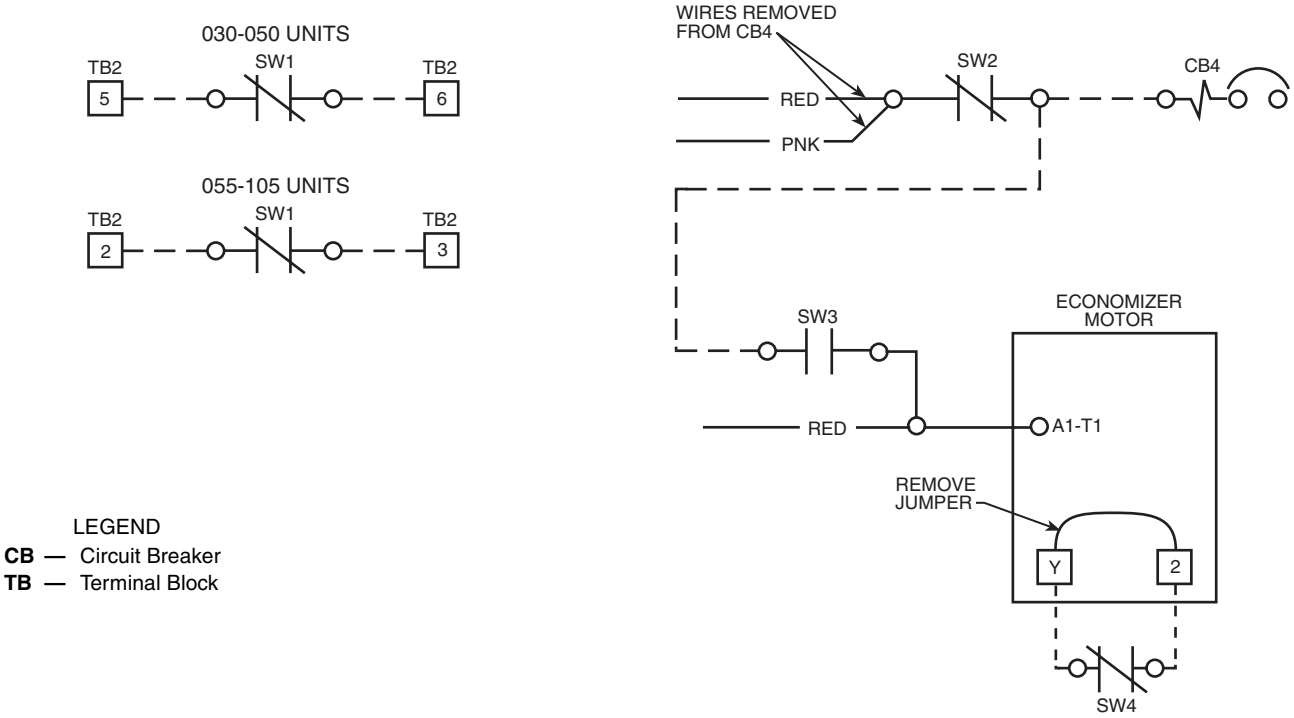


Fig. 88 — Constant Volume Smoke Control Wiring (SW-1 Through SW4)

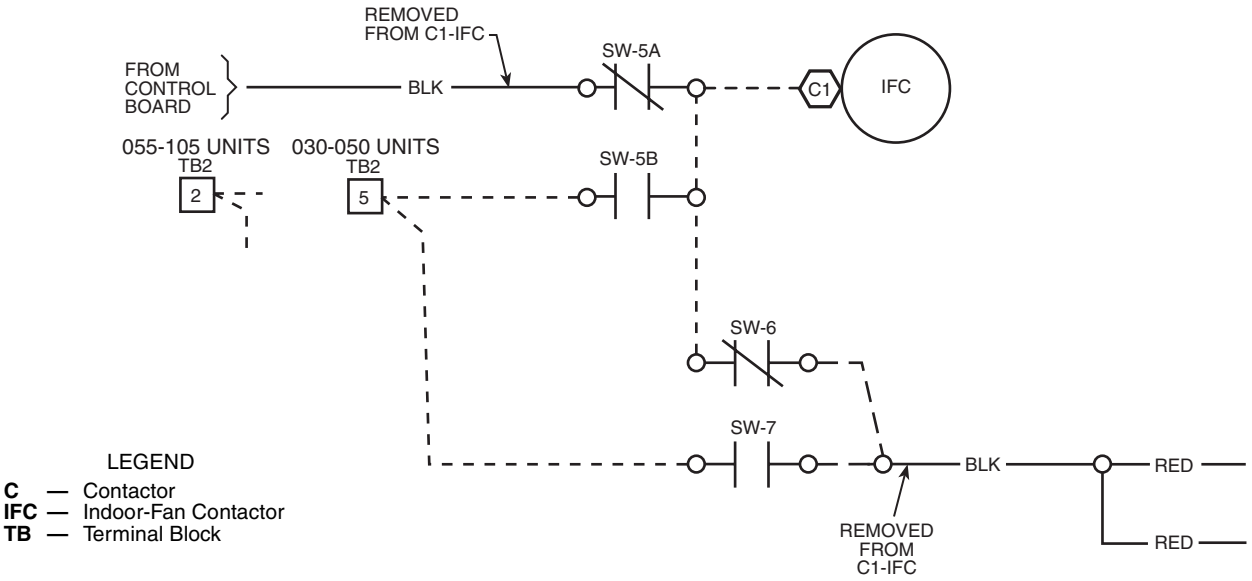


Fig. 89 — Constant Volume Units with Non-Modulating Power Exhaust, Smoke Control Wiring (SW-5 Through SW-7)

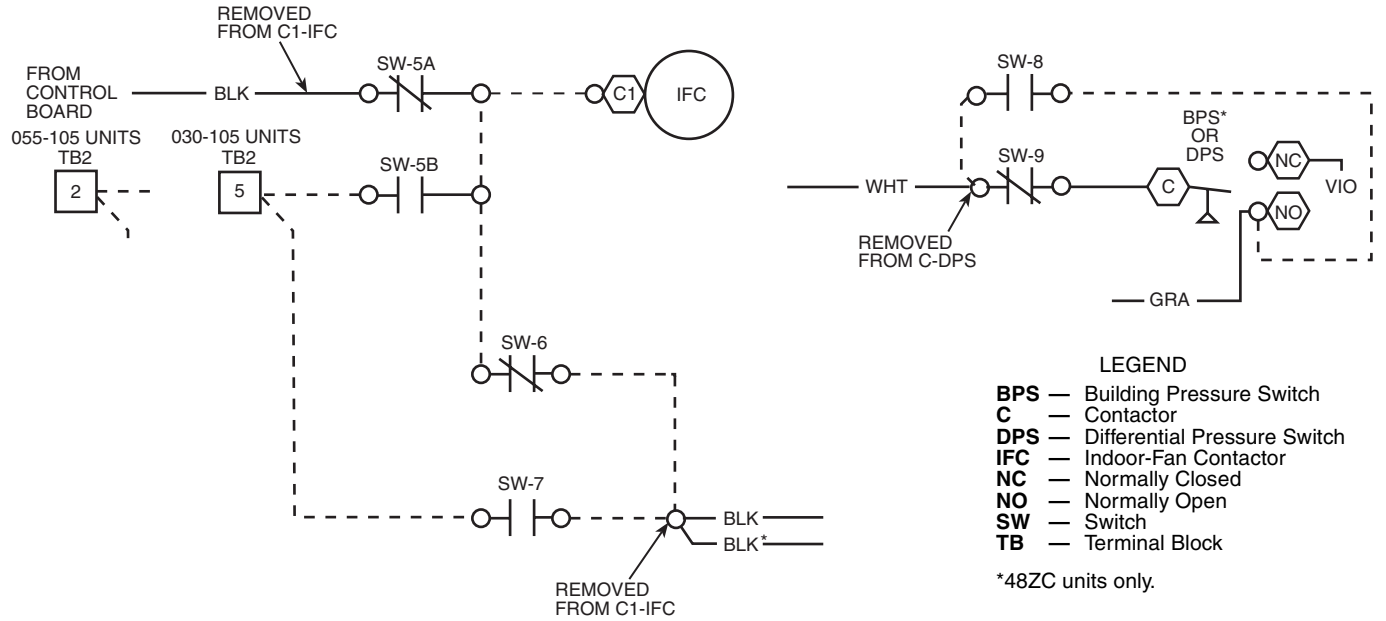


Fig. 90 — Constant Volume Units with Modulating Power Exhaust, Smoke Control Wiring (SW-5 Through SW-9)

Table 23 — Smoke Control Switches — Variable Air Volume Units (48ZE,ZR,ZV)

SMOKE CONTROL MODE	FIRE SHUTDOWN	PRESSURIZATION	EVACUATION (Modulating Power Exhaust)	SMOKE PURGE
SWITCHES USED	SW-1	SW-1	SW-1	SW-1
	SW-2	SW-2	SW-2	SW-2
		SW-4	SW-3	SW-3
		SW-5	SW-5	SW-4
		SW-6	SW-6	SW-9A/B
		SW-9A/B	SW-7	
			SW-8	

NOTE: All switches are shown in "as installed" (power OFF or deenergized) position. In these positions, none of these modes will be activated and normal unit operation is permitted by the base unit controls. To initiate any mode, all switches listed under this mode in the table must be energized, causing the contact position to change to energized position. Switches may be manually or electrically operated.

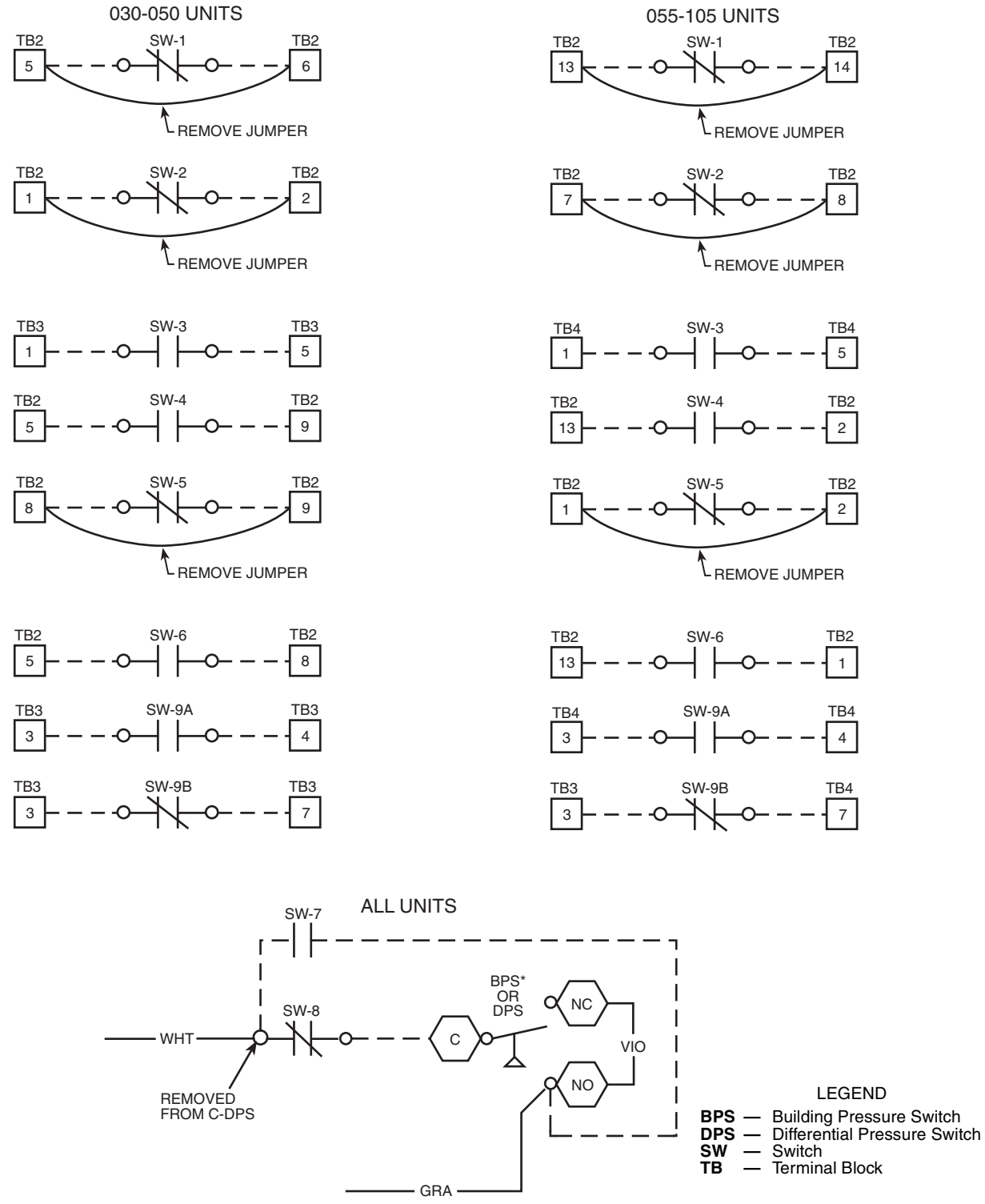
Table 24 — Smoke Control Switch Functions — Variable Air Volume Units (48ZE,ZR,ZV)

SWITCH NUMBER	CONFIGURATION	VOLTAGE	FUNCTION
SW-1	N.C.	115	Deenergize 115-v (OFC, Comp, IFC, Electric Heaters)
SW-2	N.C.	115	Deenergize TRAN7 (Process Board)
SW-3	N.O.	24	Energize EOR (Open Economizer Outside Air Dampers)
SW-4	N.O.	115	Energize IFC and CR-3 (IGV/VFD)
SW-5	N.C.	115	Isolate IFC and PEC for Separate Operation
SW-6	N.O.	115	Energize PEC (Power Exhaust)
SW-7	N.O.	24	Open PED at DPS or BPS*
SW-8	N.C.	24	Block Auto-Close at DPS (Due to Low BP)
SW-9A/B	A: N.O. B: N.C.	115 max	Single Room Terminals to Open (HIR1)

LEGEND

BP — Building Pressure
BPS — Building Pressure Switch
DPS — Differential Pressure Switch
EOR — Economizer Open Relay
HIR — Heat Interlock Relay
IFC — Indoor-Fan Contactor
IGV — Inlet Guide Vane
N.C. — Normally Closed
N.O. — Normally Open
OFC — Outdoor-Fan Contactor
PEC — Power Exhaust Contactor
PED — Power Exhaust Damper
SW — Switch
TRAN — Transformer
VFD — Variable Frequency Drive

*48ZR units only.



*48ZR units only.

Fig. 91 — Variable Air Volume Units, Smoke Control Wiring

Table 25 — Smoke Control Switches — PIC Controls Units (48ZJ,ZL,ZW)*

SMOKE CONTROL MODE	FIRE SHUTDOWN	PRESSURIZATION	EVACUATION (Modulating Power Exhaust)	SMOKE PURGE
SWITCHES USED	SW-1	SW-2	SW-3	SW-4
		SW-5A/B		SW-5A/B

*Units with PIC controls require installation of Controls Option Module (PSIO2), via factory-option or field-installed accessory, for implementation of any Smoke Control mode.

NOTE: All switches are shown in "as installed" (power OFF or deenergized) position. In these positions, none of these modes will be activated and normal unit operation is permitted by the base unit controls. To initiate any mode, all switches listed under this mode in the table must be energized, causing the contact position to change to energized position. Switches may be manually or electrically operated.

Table 26 — Smoke Control Switch Functions — PIC Controls Units (48ZJ,ZL,ZW)

SWITCH NUMBER	SWITCH CONFIGURATION	VOLTAGE	FUNCTION
SW-1	N.O.	24	Activate Fire Shutdown Mode
SW-2	N.O.	24	Activate Pressurization Mode
SW-3	N.O.	24	Activate Evacuation Mode
SW-4	N.O.	24	Activate Smoke Purge Mode
SW-5 A/B	A: N.O. B: N.C.	115	Single Room Terminals to Open (HIR1)

LEGEND

HIR — Heat Interlock Relay
N.C. — Normally Closed
N.O. — Normally Open

*Units with PIC controls require installation of Controls Option Module (PSIO2), via factory-option or field-installed accessory, for implementation of any Smoke Control mode.

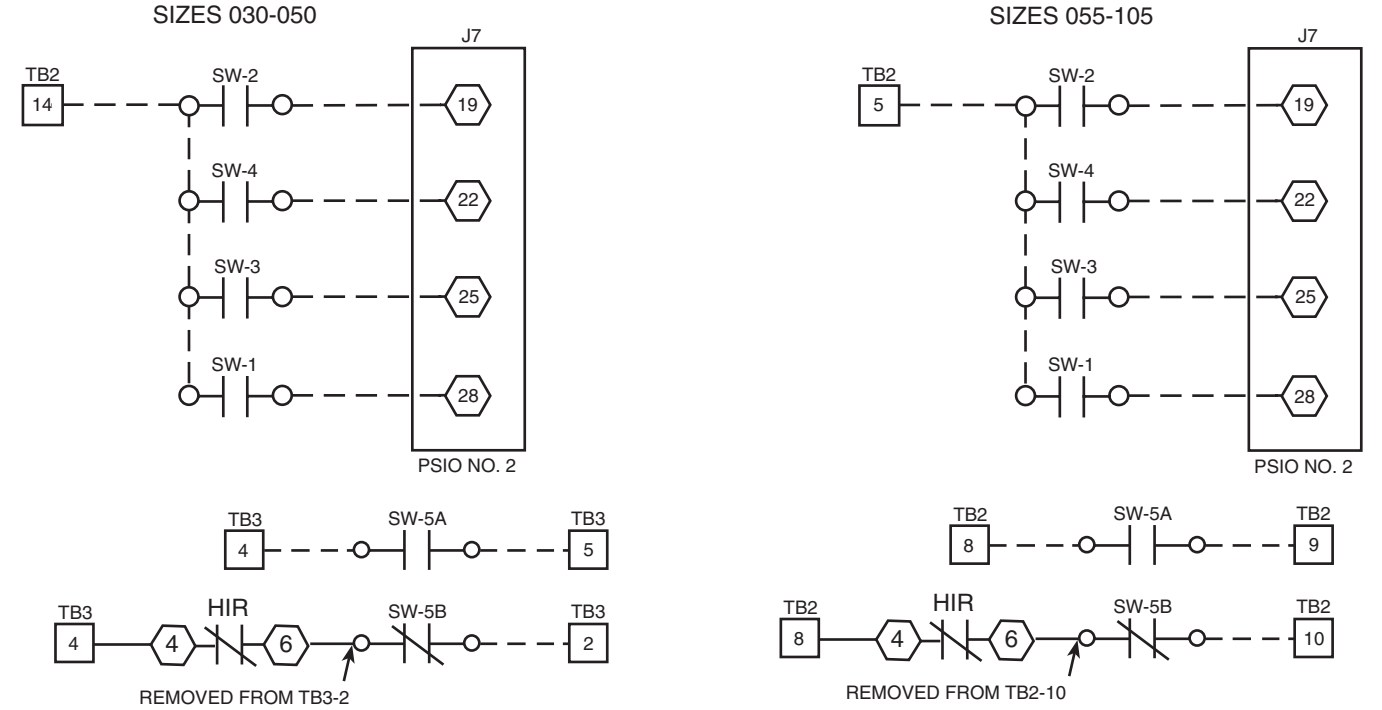


Fig. 92 — PIC Units, Smoke Control Wiring

Gas Piping — Unit is equipped for use with natural gas only. Installation must conform with local building codes, or in the absence of local codes, with the National Fuel Gas Code (NFGC), ANSI Z223.1.

A $^1/_8$-in. NPT tapping plug, accessible for test gage connection, must be field installed immediately upstream of gas supply connection to unit, but after manual gas valve. See Fig. 93. Natural gas pressure at unit gas connection must not be less than 5 in. wg (1245 Pa) or greater than 13 in. wg (3235 Pa).

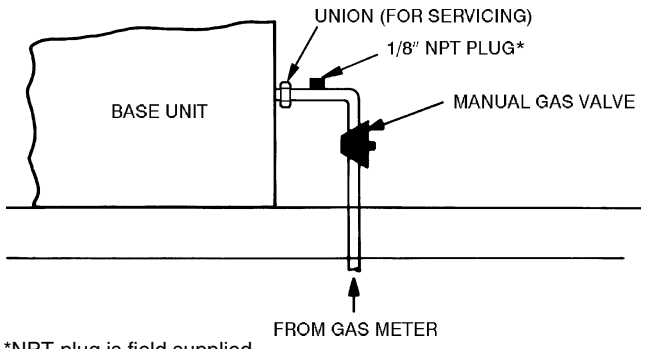
Size gas supply piping for 0.5 in. wg (124.5 Pa) maximum pressure drop. Do not use supply pipe smaller than unit gas connection.

⚠ CAUTION

Disconnect gas piping from unit when leak testing at pressures greater than 0.5 psig (3448 Pa). Pressures greater than 0.5 psig (3448 Pa) will cause gas valve damage resulting in a hazardous condition. If gas valve is subjected to pressure greater than 0.5 psig (3448 Pa), it must be replaced.

Optional Staged Gas Control — The 48Z030-105 large rooftop units may be ordered with an optional factory-installed staged gas control system that monitors heating operation of the rooftop. The control system is composed of several components as listed in sections below. Table 27 shows 48Z series Staged Gas implementation.

The staging pattern is selected based on Heat Stage Type (HTSTGTYP). A limit switch is used for staged gas control. Limit switch monitoring is configured with the LIMTMONI point. The default is YES (use limit switch monitoring). Limit switch thermistor default values are selected based on Limit Switch Thermistor High Temp (LIMTHIHT) and Limit Switch Thermistor Low Temp (LIMTLOHT). Max Capacity per changes default value is selected based on CAPMXSTG. For complete information and service instructions for Staged Gas Control Units, see Control Operation and Troubleshooting literature.



*NPT plug is field supplied.
NOTE: Follow all local codes.

Fig. 93 — Gas Piping Details

IMPORTANT: An accessory field-supplied Navigator display module is required for all staged gas control units.

Table 27 — 48Z Series Staged Gas Implementation

NO. OF STAGES	MODEL NUMBER POSITION				POINT				HEAT SIZE
	3	5	6,7,8	10	HTSTGTYP	CAPMXSTG	LIMTHIHT	LIMTLOHT	
2 stages	Z	H, K, W, Y	030 035 040 050		Default=0	Default=45	Default=170 F	Default=160 F	Low
5 stages	Z	J, L, X, Z	030 035 040 050		Default=1	Default=20	Default=170 F	Default=160 F	High
		H, K, W, Y	055 060 070		Default=1	Default=20	Default=135 F	Default=125 F	Low
		H, K	075 090 105	-,A,B C,D,E	Default=1	Default=20	Default=135 F	Default=125 F	
		H, K	075 090 105	G,H,J,K,L,M	Default=1	Default=20	Default=130 F	Default=120 F	
9 stages	Z	J, L, X, Z	055 060 070		Default=3	Default=15	Default=135 F	Default=125 F	High
		J, L	075 090 105	-,A,B C,D,E	Default=3	Default=15	Default=135 F	Default=125 F	
		J, L	075 090 105	G,H,J,K,L,M	Default=3	Default=15	Default=130 F	Default=120 F	

LEGEND

CAPMXSTG — Maximum Capacity per Changes
HTSTGTYP — Heat Stage Type
LIMTHIHT — Limit Switch Thermistor High Temperature
LIMTLOHT — Limit Switch Thermistor Low Temperature

Installing Flue/Inlet Hoods — The flue and inlet hoods are shipped in a package taped to the basepan in the fan section. The flue (outlet) hoods are pre-assembled. The flue deflector and inlet hoods require assembly.

The hoods are located on the heating section access panel as shown in Fig. 94 (sizes 030-050) or Fig. 95 (sizes 055-105). See Table 28 for a list of parts used to assemble each hood and quantities of each hood type used with each unit.

1. Remove shipping block-offs and shipping tape from all openings in the access panel.
2. Attach flue outlet hoods (see Fig. 96) to access panel using screws provided. Hoods are placed over each combustion outlet.
3. Install flue deflector baffle inside flue deflector hood. See Fig 97 for sizes 030-050 (V-type deflector). See Fig. 98 for sizes 055-105 (curve-type deflector). Install flue deflector hood assembly over each flue outlet hood (installed in Step 2). Observe the offset mounting hole locations in the deflector hood flanges when attaching hood to panel (see Fig. 99). Holes in the mounting flange must be at the bottom when attached.
4. Inlet hoods are shipped unassembled and must be assembled on the access panel (see Fig. 100). Flanges of the hood top and sides should be placed on the inside of the access panel openings. Install hood top and sides with screws provided. Attach speed clips to screen and insert screen into bottom opening of hood. Secure with 3 screws. On large inlet hoods, attach viewport cover over opening in hood (see Fig. 101). Secure with two screws.

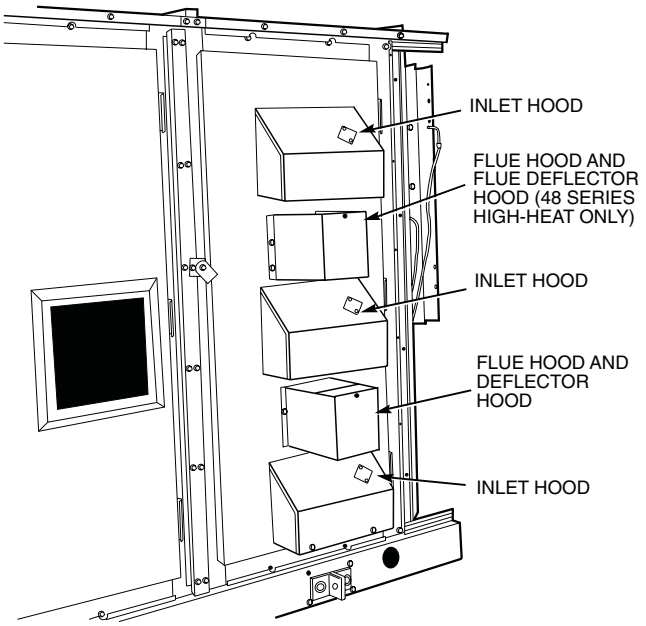


Fig. 94 — Flue/Inlet Hood Locations, 030-050 Units

Table 28 — Flue and Inlet Hood Usage

HOOD TYPE	PARTS LIST	FIG. NO.	QUANTITY USED					
			030-050 (Low Heat)	030-050 (High Heat)	055-070 (Low Heat)	055-070 (High Heat)	075-105 (Low Heat)	075-105 (High Heat)
Large Inlet (14-in.)	Top (14-in.) Side (Left) Side (Right) Screen Cover Speed Clips Screws	100,101	3	3	1	2	1	2
Small Inlet (6-in.)	Top (6-in.) Side (Left) Side (Right) Screen Cover Speed Clips Screws	100	—	—	1	1	1	1
Flue Outlet	Pre-assembled	96	1	2	2	3	2	3
Flue Deflector (V-Type)	Hood Deflector Baffle Screws	97	1	2	—	—	2	2
Flue Deflector (Curve-Type)	Hood Deflector Baffle Screws	98	—	—	2	3	—	1

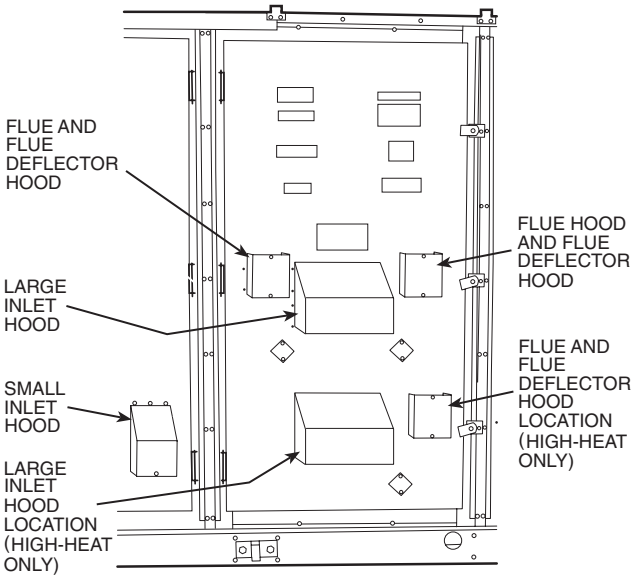

FLUE AND FLUE DEFLECTOR HOOD
FLUE HOOD AND FLUE DEFLECTOR HOOD
LARGE INLET HOOD
FLUE AND FLUE DEFLECTOR HOOD LOCATION (HIGH-HEAT ONLY)
SMALL INLET HOOD
LARGE INLET HOOD LOCATION (HIGH-HEAT ONLY)

Fig. 95 — Flue/Inlet Hood Locations, 055-105 Units

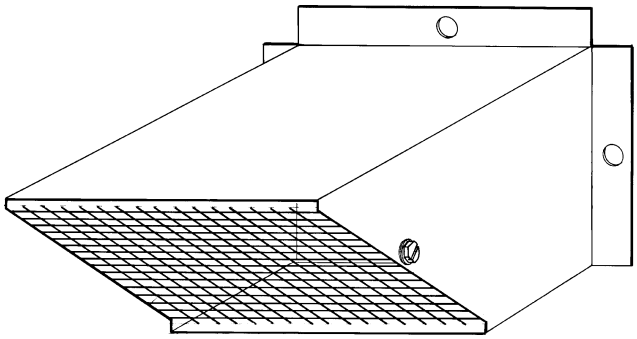


Fig. 96 — Flue Outlet Hood

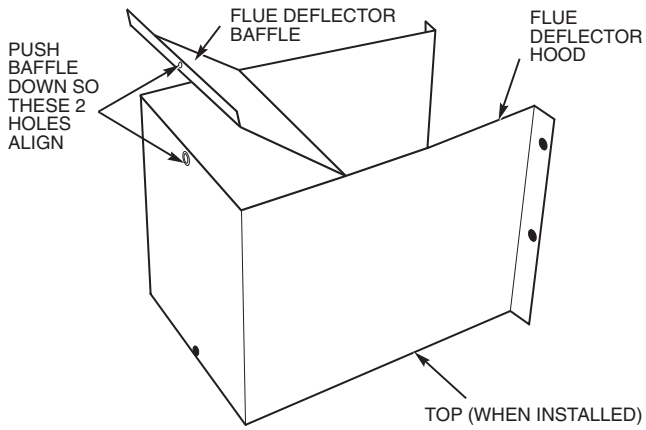


Fig. 97 — Flue Deflector Baffle, 030-050 and 075-105 Units (V-Type)

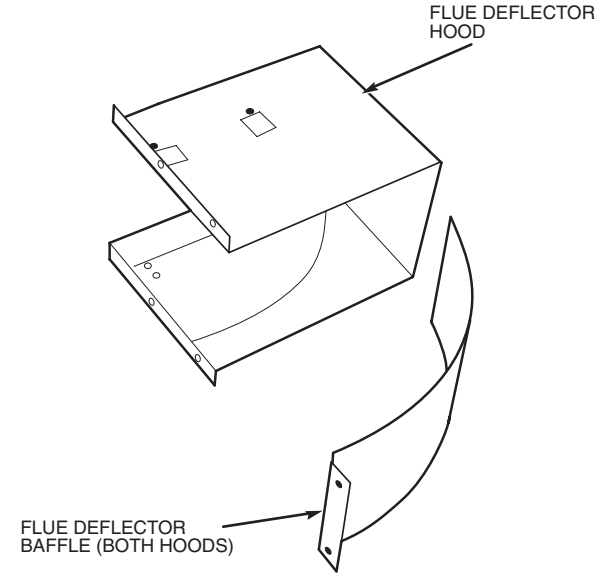


Fig. 98 — Flue Deflector Baffles, 055-105 Units (Curve-Type)

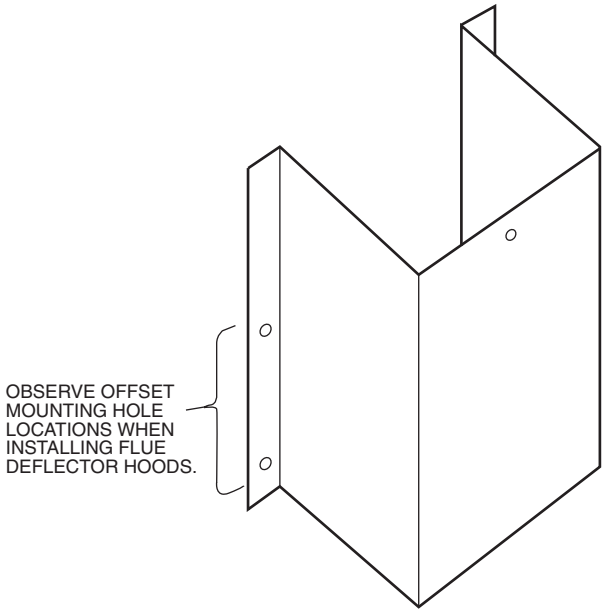


Fig. 99 — Mounting Deflector Hoods

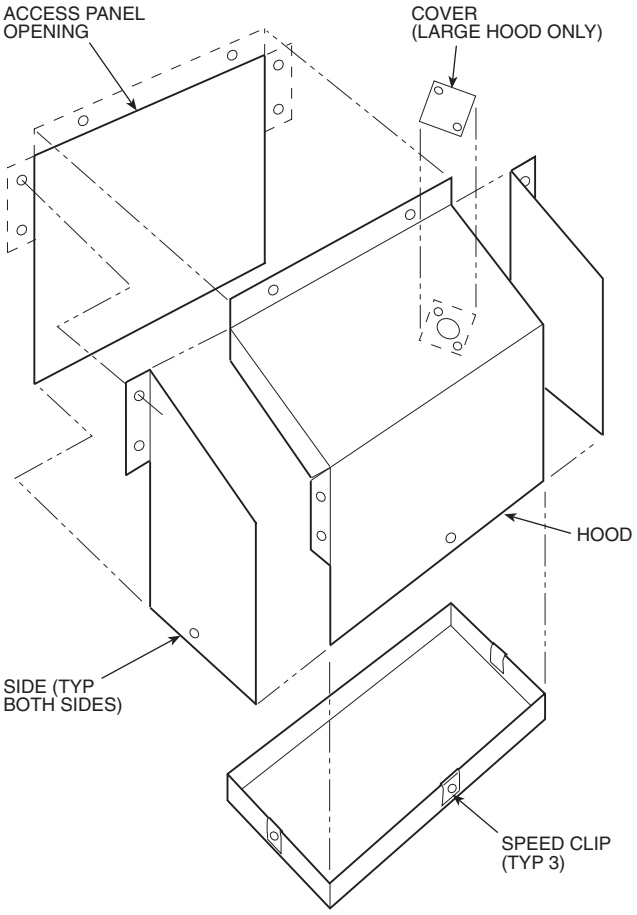


Fig. 100 — Inlet Hood Assembly

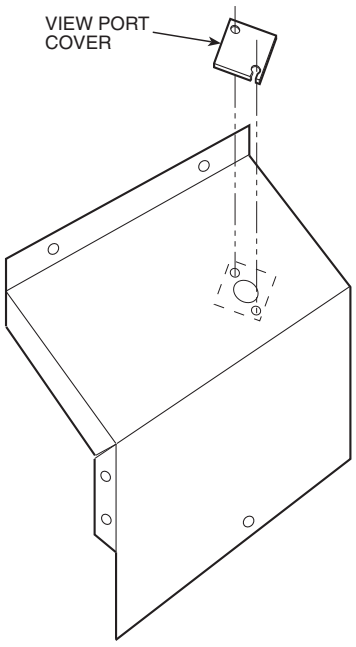


Fig. 101 — Inlet Hood View Port Cover Installation (055-105 Units Only)

PRE-START-UP

IMPORTANT: Before beginning Pre-Start-Up or Start-Up, review Start-Up Checklist at the back of this publication. The Checklist assures proper start-up of a unit and provides a record of unit condition, application requirements, system information, and operation at initial start-up.

Do not attempt to start the air-conditioning system until following checks have been completed.

System Check

1. Check the outside air hoods to ensure the hoods are fully opened and secure, with filters in place.
2. Check the supply fan suspension brackets. Shipping spacers should be removed and sleds levelled to specification.
3. Make sure flue hoods and gas section inlet hoods are properly installed.
4. Check compressor suspension. Snubber washers can be moved with finger pressure.
5. Electrical power source must agree with unit nameplate.
6. Check tightness of all electrical connections.

⚠ CAUTION

Failure to open discharge service valve prior to starting compressor can result in damage to or failure of the compressor.

7. Check caps on suction line service ports. Make sure caps are tight.
8. Backseat (open) compressor suction and discharge shutoff valves. Close valves one turn to allow refrigerant pressure to reach the test gages.
9. Oil should be visible in the compressor sight glasses. See Fig. 102. All units are factory charged with oil. Adjust the oil level as required. No oil should be removed unless the crankcase heater has been energized for at least 24 hours. See Oil Charge section on page 111 for Carrier-approved oils.
10. Perform leak test. Be sure there are no refrigerant leaks. All units are shipped with a complete operating charge of R-22 and should be under sufficient pressure for leak testing after installation. If there is no system pressure, add refrigerant until a pressure is observed and check for leaks. After leaks are repaired, remove and recover refrigerant from system. For leak testing procedures, see GTAC 2, Module 5, Charging, Recovery, Recycling and Reclamation section. Do not use the system compressors to remove refrigerant from the system.
11. *Crankcase heaters must be firmly locked into compressors, and must be on for 24 hours prior to start-up.*

⚠ CAUTION

Crankcase heaters on all units are wired into the control circuit, so they are always operable as long as the main power supply disconnect is on (closed), even if any safety device is open. Compressor heaters must be on for 24 hours prior to the start-up of any compressor.

12. Check supply fan belts, sheaves, and bearings. Check the lubrication of the fan and motor bearings. Check bearing and bearing set screws for tightness. Check sheave alignment and belt tension. Hand turn fan to ensure fan wheel does not rub on housing. The fan shaft and motor shaft must turn freely before power is applied to the unit.
13. Check exhaust fan belts, sheaves, and bearings. Check the lubrication of the fan and motor bearings. Check bearing and bearing set screws for tightness. Check sheave alignment and belt tension. Hand turn fans to ensure fan wheels do not rub on housing.
14. Check economizer linkage. Economizer dampers should be fully closed. Linkage should permit full and free travel.
15. Check that the correct return air filters are installed in the filter tracks. Do not operate unit without return air filters.
16. Check that all access doors on the air handler section have been closed and secured.
17. Check rotation of outdoor fans during first start-up check. Fan rotation is clockwise as viewed from top of unit. Fan motors are 3-phase. If fan is not turning clockwise, reverse 2 of the power wires. For supply fan and exhaust fan, check rotation per label on fan housing.

25% Outdoor-Air Damper — On units without economizer, be sure 25% outdoor-air damper is set at the desired position. Also, be sure hood is installed properly.

Economizer Inlet Screens — Check that they are in place before operating the unit.

Economizer Dampers — With no power to the unit, the economizer outdoor-air dampers should be fully closed. Check by opening the access door marked FILTER SECTION. On units with economizer, be sure economizer minimum position is set at the desired setting. Be sure hood is installed properly.

Gas Manifold Pressure — Check pressure to ensure it matches the pressure stamped on the valve body. See Gas Valve Adjustment section on page 111 for more details.

Compressor Oil — Check that compressor oil is visible in the sight glass of the compressor. All units are factory charged with oil. Observe oil level closely at start-up. If oil level is below the sight glass and cannot be seen, add oil until the level is approximately as shown in Fig. 102. See Oil Charge section on page 111 for information on adding or removing oil.

If oil charge is above sight glass, do not remove any oil until the compressor crankcase heater has been on for at least 24 hours. When additional oil or a complete charge is needed, use only Carrier-approved compressor oil.

Do not reuse drained oil and do not use any oil that has been exposed to the atmosphere.

Supply-Fan Belts, Pulleys, and Sheaves — Belts, pulleys, and sheaves are factory installed. All pulleys are nonadjustable.

See Tables 1A-1C and 3 for fan shaft center distance ranges and shaft sizes when making selections for field-supplied drives.

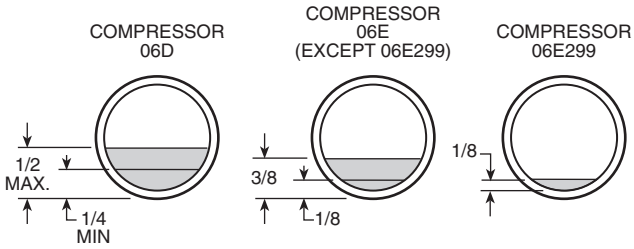


Fig. 102 — Operating Oil Levels (Sight Glass)

Factory-installed drives are fixed-speed and are nonadjustable. Refer to Tables 1A-1C for factory-supplied wheel speeds and drive set data.

If different wheel speeds are required for an application, Carrier recommends that the installer contact the nearest Browning dealer. The Browning dealer can develop the required information for the fan drive set.

For minor speed changes, the fan sheave size should be changed. Do not reduce the size of the motor sheave, this will result in reduced belt horsepower ratings and reduced belt life.

Observe the maximum wheel speed and unit airflow limits for the specific unit size and fan type.

See Tables 29-42 for supply fan performance. See Table 43 for component pressure drops.

Check rotation of wheel with arrow on the fan housing. Check fan speed with a strobe-type tachometer, or use this formula:

$$\text{Fan Rpm} = \frac{\text{motor rpm x motor sheave pitch diameter (in.)}}{\text{fan sheave pitch diameter (in.)}}$$

(Obtain motor rpm from the fan motor nameplate and read sheave pitch diameters marked on the fan and motor sheaves.)
EXAMPLE:

Nameplate motor rpm 1750
Motor sheave pitch diameter (in.) 3.4
Fan sheave pitch diameter (in.) 13.6

$$\text{Fan Rpm} = \frac{1750 \times 3.4}{13.6} = 438 \text{ Rpm}$$

The maximum allowable fan speeds are shown in the table below.

UNIT SIZE 48Z	MAXIMUM ALLOWABLE FAN SPEED (RPM)	
	Supply Fan Speed	Exhaust Fan Speed
030-050	900	1300
055-070	750	925
075-105	670 (FC) 1846 (AF)	925 (Std.) 1175 (High Cap.) 1447 (Return/Exhaust)

AF — Air Foil
FC — Forward Curved

Excessive fan speed may result in condensate carryover from the evaporator coil, fan motor overload, or wheel failure. See Tables 44 and 45 for Air Quantity Limits on page 95.

Table 29 — Fan Performance — 48ZA,ZE,ZJ030 Units*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
6,000	222	0.59	284	0.91	339	1.27	388	1.66	430	2.07	469	2.50	504	2.93	536	3.38
7,500	248	0.94	300	1.28	350	1.68	395	2.11	437	2.57	475	3.05	511	3.54	544	4.05
9,000	278	1.46	323	1.80	366	2.22	407	2.69	446	3.19	483	3.71	517	4.25	550	4.81
10,500	311	2.16	349	2.52	387	2.95	424	3.43	459	3.96	493	4.51	526	5.10	558	5.70
12,000	344	3.08	378	3.44	412	3.89	445	4.39	477	4.93	508	5.51	539	6.12	569	6.75
13,500	379	4.25	410	4.62	440	5.07	469	5.58	498	6.13	527	6.73	555	7.36	583	8.02
15,000	415	5.69	442	6.06	470	6.52	496	7.04	523	7.61	549	8.22	575	8.87	601	9.55

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
6,000	567	3.84	595	4.30	622	4.78	647	5.26	671	5.75	695	6.25	717	6.76	738	7.27
7,500	575	4.57	604	5.10	632	5.63	658	6.18	683	6.73	707	7.29	730	7.86	752	8.43
9,000	581	5.38	611	5.97	639	6.56	665	7.16	691	7.78	715	8.40	739	9.03	761	9.66
10,500	588	6.31	617	6.95	645	7.59	672	8.25	697	8.92	722	9.59	746	10.28	769	10.97
12,000	598	7.41	625	8.08	652	8.77	679	9.47	704	10.19	728	10.91	752	11.65	775	12.39
13,500	610	8.71	637	9.41	662	10.14	687	10.88	712	11.63	736	12.40	759	13.18	782	13.98
15,000	626	10.25	651	10.98	675	11.74	699	12.51	723	13.30	746	14.10	768	14.92	790	15.75

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
6,000	759	7.79	779	8.32	799	8.85	817	9.39
7,500	773	9.01	794	9.60	814	10.20	833	10.80
9,000	783	10.30	805	10.95	825	11.60	845	12.26
10,500	791	11.67	812	12.38	833	13.09	854	13.81
12,000	797	13.15	819	13.91	840	14.68	860	15.45
13,500	804	14.77	825	15.59	846	16.41	867	17.23
15,000	812	16.59	833	17.45	853	18.31	874	19.19

LEGEND

VAV units only.

Bhp — Brake Horsepower

*Fan performance tables do not include pressure drops for low heat, high heat, or high-capacity coils. Refer to Component Pressure drop tables on page 95 and add appropriate pressure drop data.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop, Table 43, before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp} \times .746}{\text{Motor efficiency}}$$

See Tables 1A-1C, Physical Data, for motor efficiency.

Table 30 — Fan Performance — 48ZA,ZE,ZJ035 Units*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
7,000	246	0.84	301	1.19	352	1.58	398	2.01	440	2.46	479	2.93	514	3.40	547	3.90
8,000	266	1.14	315	1.50	362	1.92	406	2.37	447	2.85	484	3.35	519	3.87	552	4.39
10,000	310	1.98	350	2.36	389	2.80	427	3.30	464	3.83	499	4.38	532	4.96	564	5.55
12,000	357	3.20	390	3.60	424	4.06	457	4.58	489	5.15	520	5.74	551	6.36	580	7.01
14,000	406	4.87	435	5.28	463	5.76	492	6.30	520	6.89	548	7.52	576	8.18	603	8.86
15,000	430	5.89	458	6.31	485	6.80	511	7.35	538	7.95	564	8.59	590	9.26	616	9.96

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
7,000	577	4.40	606	4.91	633	5.43	659	5.95	684	6.49	707	7.03	730	7.58	752	8.14
8,000	583	4.94	612	5.49	640	6.05	666	6.62	691	7.19	715	7.78	738	8.37	760	8.97
10,000	594	6.16	623	6.79	651	7.42	677	8.07	703	8.73	727	9.39	751	10.06	774	10.74
12,000	609	7.67	636	8.36	663	9.05	689	9.77	714	10.49	738	11.22	762	11.97	785	12.72
14,000	629	9.57	655	10.30	680	11.04	704	11.81	728	12.59	751	13.38	774	14.18	796	14.99
15,000	641	10.69	666	11.44	690	12.20	714	12.99	737	13.79	760	14.61	782	15.44	804	16.28

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
7,000	773	8.70	793	9.27	813	9.85	832	10.43
8,000	782	9.57	802	10.18	823	10.80	842	11.43
10,000	796	11.42	817	12.11	838	12.81	858	13.52
12,000	807	13.48	828	14.25	849	15.02	869	15.80
14,000	818	15.82	840	16.66	860	17.50	880	18.35
15,000	825	17.13	846	18.00	866	18.87	886	19.76

LEGEND

VAV units only.

Bhp — Brake Horsepower

*Fan performance tables do not include pressure drops for low heat, high heat, or high-capacity coils. Refer to Component Pressure drop tables on page 95 and add appropriate pressure drop data.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop, Table 43, before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp} \times .746}{\text{Motor efficiency}}$$

See Tables 1A-1C, Physical Data, for motor efficiency.

Table 31 — Fan Performance — 48ZA,ZE,ZJ040 Units*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
8,000	252	0.98	303	1.33	350	1.72	394	2.14	434	2.58	472	3.06	507	3.55	540	4.07
10,000	290	1.67	333	2.11	373	2.55	412	3.01	448	3.51	483	4.03	517	4.58	549	5.16
12,000	330	2.65	369	3.18	404	3.70	438	4.23	470	4.78	501	5.35	532	5.94	562	6.56
14,000	372	3.96	407	4.61	439	5.22	469	5.83	498	6.44	526	7.07	554	7.72	581	8.38
16,000	415	5.67	447	6.44	476	7.15	504	7.85	530	8.54	556	9.24	581	9.95	605	10.67
18,000	459	7.84	488	8.72	515	9.55	541	10.34	565	11.12	589	11.91	612	12.69	634	13.47
20,000	503	10.51	530	11.51	555	12.46	579	13.36	602	14.24	624	15.11	645	15.98	666	16.84

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
8,000	571	4.60	600	5.14	628	5.70	654	6.27	679	6.85	703	7.44	726	8.04	748	8.65
10,000	579	5.75	608	6.36	636	6.98	662	7.62	688	8.28	712	8.94	736	9.62	758	10.30
12,000	590	7.21	618	7.87	645	8.55	671	9.25	696	9.96	720	10.69	744	11.43	766	12.19
14,000	607	9.07	633	9.78	658	10.51	683	11.25	707	12.02	730	12.80	753	13.60	775	14.41
16,000	629	11.41	653	12.16	676	12.94	699	13.73	722	14.54	744	15.37	766	16.22	787	17.08
18,000	656	14.28	678	15.09	700	15.91	721	16.76	742	17.62	762	18.49	783	19.39	803	20.29
20,000	687	17.71	707	18.60	727	19.48	747	20.38	766	21.30	785	22.22	804	23.17	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
8,000	770	9.27	791	9.90	811	10.54	830	11.18
10,000	780	11.00	802	11.71	822	12.43	842	13.15
12,000	789	12.96	810	13.73	831	14.52	851	15.32
14,000	797	15.24	818	16.07	839	16.93	859	17.79
16,000	808	17.95	828	18.85	849	19.75	868	20.67
18,000	823	21.21	842	22.15	862	23.11	—	—
20,000	—	—	—	—	—	—	—	—

LEGEND

VAV units only.

Bhp — Brake Horsepower

*Fan performance tables do not include pressure drops for low heat, high heat, or high-capacity coils. Refer to Component Pressure drop tables on page 95 and add appropriate pressure drop data.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop, Table 43, before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp} \times .746}{\text{Motor efficiency}}$$

See Tables 1A-1C, Physical Data, for motor efficiency.

Table 32 — Fan Performance — 48ZA,ZE,ZJ050 Units*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
9,000	276	1.34	323	1.73	366	2.15	407	2.60	445	3.08	482	3.58	516	4.11	549	4.66
10,000	296	1.74	339	2.17	379	2.62	418	3.09	454	3.59	489	4.12	522	4.68	554	5.26
12,000	339	2.76	376	3.29	411	3.81	445	4.35	477	4.91	509	5.49	539	6.09	568	6.71
14,000	382	4.15	416	4.79	448	5.40	478	6.01	506	6.63	535	7.26	562	7.92	589	8.60
16,000	427	5.96	458	6.71	487	7.42	514	8.11	540	8.81	565	9.52	590	10.23	615	10.97
18,000	473	8.26	501	9.12	527	9.93	552	10.72	576	11.50	600	12.29	623	13.08	645	13.88
20,000	519	11.10	545	12.06	570	12.99	593	13.88	615	14.76	637	15.63	658	16.50	679	17.38

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
9,000	579	5.23	608	5.81	636	6.41	662	7.02	687	7.64	712	8.27	735	8.91	757	9.57
10,000	584	5.85	613	6.47	641	7.10	667	7.74	692	8.40	717	9.07	740	9.75	763	10.44
12,000	597	7.36	625	8.03	651	8.72	677	9.42	702	10.14	726	10.88	750	11.63	772	12.39
14,000	615	9.29	641	10.01	666	10.74	690	11.50	714	12.27	738	13.06	760	13.87	783	14.69
16,000	639	11.71	663	12.48	686	13.27	709	14.07	731	14.89	753	15.73	775	16.58	796	17.45
18,000	667	14.69	689	15.51	711	16.35	732	17.20	753	18.07	773	18.96	793	19.86	813	20.78
20,000	699	18.25	719	19.14	739	20.04	759	20.95	778	21.88	797	22.82	816	23.77	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
9,000	779	10.23	800	10.90	821	11.58	840	12.27
10,000	785	11.14	806	11.85	826	12.57	846	13.30
12,000	794	13.16	816	13.94	836	14.73	857	15.54
14,000	804	15.52	825	16.37	846	17.22	866	18.10
16,000	817	18.34	837	19.24	857	20.15	877	21.08
18,000	833	21.71	853	22.66	872	23.62	—	—
20,000	—	—	—	—	—	—	—	—

LEGEND

VAV units only.

Bhp — Brake Horsepower

*Fan performance tables do not include pressure drops for low heat, high heat, or high-capacity coils. Refer to Component Pressure drop tables on page 95 and add appropriate pressure drop data.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop, Table 43, before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Tables 1A-1C, Physical Data, for motor efficiency

Table 33 — Fan Performance — 48ZA,ZE,ZJ055 Units*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
10,000	207	1.04	253	1.50	295	2.03	334	2.66	371	3.41	405	4.26	438	5.20	468	6.20
12,500	235	1.69	276	2.23	312	2.78	346	3.40	379	4.10	410	4.88	440	5.75	469	6.70
15,000	265	2.59	302	3.23	335	3.85	365	4.51	394	5.20	422	5.96	449	6.78	476	7.67
17,500	295	3.78	331	4.52	361	5.24	389	5.97	415	6.71	440	7.48	465	8.30	489	9.17
20,000	327	5.31	360	6.15	388	6.98	414	7.79	439	8.60	462	9.43	485	10.28	507	11.17
22,500	359	7.23	390	8.16	417	9.09	442	10.00	465	10.90	487	11.81	508	12.72	528	13.65
25,000	392	9.59	421	10.60	447	11.62	470	12.64	492	13.64	513	14.63	533	15.62	552	16.62

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
10,000	497	7.27	523	8.39	549	9.55	573	10.75	596	11.98	618	13.23	639	14.51	659	15.81
12,500	497	7.73	523	8.83	549	10.00	573	11.22	597	12.49	619	13.81	641	15.16	662	16.55
15,000	501	8.63	526	9.67	550	10.77	574	11.94	597	13.17	619	14.46	641	15.80	662	17.19
17,500	512	10.09	535	11.07	557	12.11	579	13.21	601	14.38	622	15.60	643	16.88	663	18.21
20,000	528	12.09	549	13.06	570	14.07	590	15.12	610	16.24	630	17.40	649	18.62	668	19.89
22,500	548	14.60	567	15.59	587	16.61	605	17.66	624	18.75	642	19.88	660	21.06	678	22.28
25,000	571	17.63	589	18.66	607	19.71	624	20.78	642	21.89	659	23.02	676	24.19	692	25.39

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
10,000	679	17.13	697	18.46	715	19.81	733	21.17
12,500	682	17.98	702	19.43	721	20.90	739	22.40
15,000	682	18.63	702	20.10	721	21.62	740	23.17
17,500	683	19.60	702	21.04	721	22.53	740	24.06
20,000	687	21.20	706	22.57	724	24.00	742	25.46
22,500	696	23.55	713	24.86	731	26.22	748	27.62
25,000	709	26.62	725	27.91	741	29.22	—	—

LEGEND

VAV units only.

Bhp — Brake Horsepower

*Fan performance tables do not include pressure drops for low heat, high heat, or high-capacity coils. Refer to Component Pressure drop tables on page 95 and add appropriate pressure drop data.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop, Table 43, before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp} \times .746}{\text{Motor efficiency}}$$

See Tables 1A-1C, Physical Data, for motor efficiency

Table 34 — Fan Performance — 48ZA,ZE,ZJ060 Units*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
12,000	234	1.54	276	2.03	312	2.57	348	3.20	382	3.93	415	4.74	446	5.63	476	6.58
15,000	271	2.65	309	3.27	341	3.88	370	4.53	399	5.24	428	6.04	455	6.91	482	7.85
18,000	308	4.22	344	5.00	374	5.73	400	6.46	426	7.22	450	8.02	474	8.88	498	9.81
21,000	348	6.36	380	7.29	408	8.18	434	9.04	457	9.88	479	10.74	501	11.64	522	12.58
24,000	390	9.19	417	10.24	444	11.29	469	12.29	491	13.27	512	14.23	532	15.21	551	16.20
27,000	433	12.80	456	13.93	481	15.14	504	16.30	526	17.44	546	18.53	565	19.62	583	20.71
30,000	476	17.29	497	18.50	519	19.82	541	21.15	562	22.45	581	23.70	599	24.93	617	26.14

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
12,000	504	7.56	530	8.57	555	9.61	578	10.66	600	11.73	621	12.81	641	13.91	660	15.01
15,000	509	8.87	535	9.95	559	11.07	583	12.25	606	13.45	628	14.68	650	15.95	670	17.23
18,000	521	10.79	544	11.85	567	12.97	590	14.14	612	15.38	633	16.66	654	17.99	675	19.36
21,000	543	13.56	563	14.60	583	15.69	603	16.84	623	18.05	643	19.31	662	20.63	682	21.99
24,000	570	17.22	588	18.28	607	19.39	625	20.53	642	21.72	660	22.95	678	24.24	695	25.58
27,000	601	21.81	618	22.93	635	24.07	651	25.25	667	26.46	684	27.70	700	28.98	715	30.31
30,000	634	27.34	650	28.56	666	29.78	681	31.02	696	32.28	711	33.56	726	34.88	—-	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
12,000	679	16.11	697	17.23	714	18.35	730	19.49
15,000	690	18.52	709	19.84	727	21.15	745	22.49
18,000	695	20.76	714	22.20	733	23.66	—	—
21,000	701	23.41	719	24.87	738	26.38	—	—
24,000	713	26.97	730	28.40	747	29.89	—	—
27,000	731	31.67	747	33.08	—-	—	—	—
30,000	—	—	—	—	—	—	—	—

LEGEND

VAV units only.

Bhp — Brake Horsepower

*Fan performance tables do not include pressure drops for low heat, high heat, or high-capacity coils. Refer to Component Pressure drop tables on page 95 and add appropriate pressure drop data.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop, Table 43, before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Tables 1A-1C, Physical Data, for motor efficiency

Table 35 — Fan Performance — 48ZA,ZE,ZJ070 Units*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
14,000	258	2.23	297	2.80	330	3.38	362	4.02	392	4.73	422	5.53	451	6.42	480	7.37
17,500	302	3.92	338	4.67	368	5.39	395	6.10	421	6.84	446	7.64	471	8.50	495	9.42
21,000	348	6.36	380	7.29	408	8.18	434	9.04	457	9.88	479	10.74	501	11.64	522	12.57
24,500	397	9.74	424	10.80	450	11.88	475	12.91	497	13.91	517	14.89	537	15.88	556	16.89
28,000	447	14.18	470	15.35	494	16.60	516	17.82	538	19.01	558	20.16	576	21.29	594	22.41
30,000	476	17.29	497	18.50	519	19.82	541	21.15	562	22.45	581	23.70	599	24.93	617	26.14

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
14,000	507	8.39	533	9.46	558	10.57	582	11.71	605	12.89	627	14.08	648	15.29	668	16.52
17,500	519	10.42	542	11.48	565	12.60	588	13.78	610	15.02	632	16.30	653	17.62	674	18.99
21,000	543	13.56	563	14.60	583	15.69	603	16.84	623	18.05	643	19.31	662	20.63	682	21.99
24,500	575	17.93	593	18.99	611	20.10	629	21.24	646	22.43	664	23.67	681	24.96	698	26.29
28,000	612	23.55	628	24.69	645	25.86	661	27.05	677	28.27	692	29.53	708	30.82	723	32.15
30,000	634	27.34	650	28.56	666	29.78	681	31.02	696	32.28	711	33.56	726	34.88	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
14,000	687	17.76	706	19.01	724	20.27	741	21.54
17,500	694	20.38	713	21.79	732	23.24	—	—
21,000	701	23.41	719	24.87	738	26.38	—	—
24,500	715	27.67	732	29.10	749	30.58	—	—
28,000	739	33.51	—	—	—	—	—	—
30,000	—	—	—	—	—	—	—	—

LEGEND

VAV units only.

Bhp — Brake Horsepower

*Fan performance tables do not include pressure drops for low heat, high heat, or high-capacity coils. Refer to Component Pressure drop tables on page 95 and add appropriate pressure drop data.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop, Table 43, before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Tables 1A-1C, Physical Data, for motor efficiency

Table 36 — Fan Performance — 48ZA,ZC,ZE,ZJ,ZL,ZR,ZT,ZV,ZW075 Units*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
15,000	221	2.79	252	3.53	280	4.31	306	5.14	331	6.01	354	6.92	377	7.86	398	8.84
16,000	232	3.27	261	4.06	288	4.88	313	5.74	337	6.65	360	7.59	381	8.57	402	9.58
18,000	253	4.42	281	5.31	305	6.21	329	7.14	351	8.11	372	9.12	393	10.17	413	11.25
20,000	275	5.83	301	6.82	324	7.81	346	8.82	366	9.86	386	10.94	406	12.05	425	13.20
22,000	298	7.53	321	8.62	343	9.70	364	10.80	383	11.92	402	13.07	420	14.25	438	15.46
24,000	320	9.55	342	10.75	363	11.93	383	13.11	401	14.31	419	15.54	436	16.79	453	18.07
26,000	343	11.91	364	13.22	384	14.50	402	15.78	420	17.07	437	18.37	453	19.70	469	21.05
28,000	367	14.65	386	16.06	405	17.45	422	18.83	439	20.20	455	21.59	471	23.00	486	24.43
30,000	390	17.78	408	19.31	426	20.80	443	22.28	459	23.75	474	25.24	489	26.73	504	28.24

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
15,000	419	9.84	439	10.86	459	11.91	478	12.98	496	14.06	514	15.16	531	16.28	548	17.41
16,000	423	10.62	442	11.68	462	12.77	480	13.88	498	15.00	516	16.15	533	17.31	550	18.48
18,000	432	12.36	450	13.50	469	14.66	486	15.84	504	17.05	521	18.27	537	19.53	553	20.78
20,000	443	14.38	460	15.58	478	16.82	495	18.07	511	19.35	527	20.65	543	21.98	559	23.32
22,000	455	16.70	472	17.98	489	19.28	505	20.60	521	21.96	536	23.33	551	24.72	566	26.14
24,000	470	19.38	486	20.72	501	22.08	517	23.48	532	24.89	547	26.34	561	27.80	576	29.29
26,000	485	22.43	500	23.83	515	25.27	530	26.73	544	28.22	559	29.72	573	31.26	586	32.81
28,000	501	25.89	516	27.36	530	28.86	544	30.38	558	31.94	572	33.51	585	35.11	599	36.74
30,000	518	29.76	533	31.32	546	32.89	560	34.48	573	36.10	586	37.74	599	39.41	612	41.11

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
15,000	565	18.56	581	19.72	597	20.89	612	22.06
16,000	566	19.68	582	20.88	597	22.10	613	23.33
18,000	569	22.06	585	23.36	600	24.66	615	25.99
20,000	574	24.68	589	26.06	604	27.45	618	28.85
22,000	581	27.57	596	29.04	610	30.51	624	31.99
24,000	590	30.80	604	32.33	617	33.88	631	35.44
26,000	600	34.39	613	35.99	627	37.61	640	39.24
28,000	612	38.38	624	40.05	637	41.74	650	43.44
30,000	624	42.81	637	44.54	649	46.29	661	48.06

LEGEND

VAV units only.

Bhp — Brake Horsepower

*Fan performance tables do not include pressure drops for low heat, high heat, or high-capacity coils. Refer to Component Pressure drop tables on page 95 and add appropriate pressure drop data.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop, Table 43, before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Tables 1A-1C, Physical Data, for motor efficiency

Table 37 — Fan Performance — 48ZA,ZC,ZE,ZJ,ZL,ZR,ZT,ZV,ZW090 Units*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
17,000	242	3.82	271	4.66	297	5.51	321	6.41	344	7.35	366	8.33	387	9.34	407	10.38
18,000	253	4.42	281	5.31	305	6.21	329	7.14	351	8.11	372	9.12	393	10.17	413	11.25
20,000	275	5.83	301	6.82	324	7.81	346	8.82	366	9.86	386	10.94	406	12.05	425	13.20
22,000	298	7.53	321	8.62	343	9.70	364	10.80	383	11.92	402	13.07	420	14.25	438	15.46
24,000	320	9.55	342	10.75	363	11.93	383	13.11	401	14.31	419	15.54	436	16.79	453	18.07
26,000	343	11.91	364	13.22	384	14.50	402	15.78	420	17.07	437	18.37	453	19.70	469	21.05
28,000	367	14.65	386	16.06	405	17.45	422	18.83	439	20.20	455	21.59	471	23.00	486	24.43
30,000	390	17.78	408	19.31	426	20.80	443	22.28	459	23.75	474	25.24	489	26.73	504	28.24
32,000	414	21.36	431	22.99	448	24.59	464	26.17	479	27.75	494	29.32	508	30.90	523	32.49
34,000	437	25.39	454	27.13	470	28.84	485	30.53	500	32.20	514	33.87	528	35.55	542	37.23

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
17,000	427	11.45	446	12.55	465	13.68	483	14.83	501	16.00	518	17.19	535	18.39	551	19.61
18,000	432	12.36	450	13.50	469	14.66	486	15.84	504	17.05	521	18.27	537	19.53	553	20.78
20,000	443	14.38	460	15.58	478	16.82	495	18.07	511	19.35	527	20.65	543	21.98	559	23.32
22,000	455	16.70	472	17.98	489	19.28	505	20.60	521	21.96	536	23.33	551	24.72	566	26.14
24,000	470	19.38	486	20.72	501	22.08	517	23.48	532	24.89	547	26.34	561	27.80	576	29.29
26,000	485	22.43	500	23.83	515	25.27	530	26.73	544	28.22	559	29.72	573	31.26	586	32.81
28,000	501	25.89	516	27.36	530	28.86	544	30.38	558	31.94	572	33.51	585	35.11	599	36.74
30,000	518	29.76	533	31.32	546	32.89	560	34.48	573	36.10	586	37.74	599	39.41	612	41.11
32,000	536	34.11	550	35.73	563	37.38	576	39.04	589	40.73	601	42.45	614	44.18	626	45.94
34,000	555	38.92	568	40.63	581	42.36	593	44.10	605	45.87	618	47.64	630	49.45	641	51.27

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
17,000	567	20.85	583	22.10	598	23.36	613	24.63
18,000	569	22.06	585	23.36	600	24.66	615	25.99
20,000	574	24.68	589	26.06	604	27.45	618	28.85
22,000	581	27.57	596	29.04	610	30.51	624	31.99
24,000	590	30.80	604	32.33	617	33.88	631	35.44
26,000	600	34.39	613	35.99	627	37.61	640	39.24
28,000	612	38.38	624	40.05	637	41.74	650	43.44
30,000	624	42.81	637	44.54	649	46.29	661	48.06
32,000	638	47.72	650	49.51	662	51.33	674	53.17
34,000	653	53.12	665	54.98	676	56.87	—	—

LEGEND

VAV units only.

Bhp — Brake Horsepower

*Fan performance tables do not include pressure drops for low heat, high heat, or high-capacity coils. Refer to Component Pressure drop tables on page 95 and add appropriate pressure drop data.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop, Table 43, before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp} \times .746}{\text{Motor efficiency}}$$

See Tables 1A-1C, Physical Data, for motor efficiency

Table 38 — Fan Performance — 48ZA,ZC,ZE,ZJ,ZL,ZR,ZT,ZV,ZW105 Units*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
20,000	275	5.83	301	6.82	324	7.81	346	8.82	366	9.86	386	10.94	406	12.05	425	13.20
22,000	298	7.53	321	8.62	343	9.70	364	10.80	383	11.92	402	13.07	420	14.25	438	15.46
24,000	320	9.55	342	10.75	363	11.93	383	13.11	401	14.31	419	15.54	436	16.79	453	18.07
26,000	343	11.91	364	13.22	384	14.50	402	15.78	420	17.07	437	18.37	453	19.70	469	21.05
28,000	367	14.65	386	16.06	405	17.45	422	18.83	439	20.20	455	21.59	471	23.00	486	24.43
30,000	390	17.78	408	19.31	426	20.80	443	22.28	459	23.75	474	25.24	489	26.73	504	28.24
32,000	414	21.36	431	22.99	448	24.59	464	26.17	479	27.75	494	29.32	508	30.90	523	32.49
34,000	437	25.39	454	27.13	470	28.84	485	30.53	500	32.20	514	33.87	528	35.55	542	37.23
36,000	461	29.92	477	31.77	492	33.58	506	35.38	521	37.16	534	38.93	548	40.69	561	42.47
38,000	485	34.96	500	36.91	514	38.85	528	40.74	542	42.63	555	44.50	568	46.36	581	48.23
40,000	509	40.54	523	42.61	537	44.65	550	46.66	563	48.64	576	50.62	589	52.59	601	54.56

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
20,000	443	14.38	460	15.58	478	16.82	495	18.07	511	19.35	527	20.65	543	21.98	559	23.32
22,000	455	16.70	472	17.98	489	19.28	505	20.60	521	21.96	536	23.33	551	24.72	566	26.14
24,000	470	19.38	486	20.72	501	22.08	517	23.48	532	24.89	547	26.34	561	27.80	576	29.29
26,000	485	22.43	500	23.83	515	25.27	530	26.73	544	28.22	559	29.72	573	31.26	586	32.81
28,000	501	25.89	516	27.36	530	28.86	544	30.38	558	31.94	572	33.51	585	35.11	599	36.74
30,000	518	29.76	533	31.32	546	32.89	560	34.48	573	36.10	586	37.74	599	39.41	612	41.11
32,000	536	34.11	550	35.73	563	37.38	576	39.04	589	40.73	601	42.45	614	44.18	626	45.94
34,000	555	38.92	568	40.63	581	42.36	593	44.10	605	45.87	618	47.64	630	49.45	641	51.27
36,000	574	44.25	586	46.03	599	47.85	611	49.67	623	51.51	634	53.37	646	55.25	657	57.14
38,000	593	50.10	605	51.98	617	53.87	629	55.77	640	57.71	652	59.63	663	61.59	674	63.54
40,000	613	56.52	625	58.49	636	60.48	648	62.46	659	64.47	—	—	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
20,000	574	24.68	589	26.06	604	27.45	618	28.86
22,000	581	27.57	596	29.04	610	30.51	624	31.99
24,000	590	30.80	604	32.33	617	33.88	631	35.44
26,000	600	34.39	613	35.99	627	37.61	640	39.24
28,000	612	38.38	624	40.05	637	41.74	650	43.44
30,000	624	42.81	637	44.54	649	46.29	661	48.06
32,000	638	47.72	650	49.51	662	51.33	674	53.17
34,000	653	53.12	665	54.98	676	56.87	—	—
36,000	669	59.06	680	60.98	—	—	—	—
38,000	—	—	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—

LEGEND

VAV units only.

Bhp — Brake Horsepower

*Fan performance tables do not include pressure drops for low heat, high heat, or high-capacity coils. Refer to Component Pressure drop tables on page 95 and add appropriate pressure drop data.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop, Table 43, before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Tables 1A-1C, Physical Data, for motor efficiency

Table 39 — Fan Performance — Power Exhaust
(Size 030-050 Units)

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	0.2		0.4		0.6		0.8	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6,000	641	1.34	903	2.54	1026	3.33	1111	3.97
8,000	715	2.47	909	3.39	1128	5.10	1253	6.37
10,000	829	4.43	948	5.02	1111	6.25	—	—
12,000	953	7.28	1048	7.84	1151	8.64	1282	9.98
14,000	1083	11.19	1163	11.77	1246	12.47	—	—
16,000	1216	16.29	1286	16.92	—	—	—	—

Bhp — Brake Horsepower

Table 40 — Fan Performance — Power Exhaust
(Size 055-070 Units)

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	416	1.65	469	2.03	522	2.47	574	2.97	624	3.51	673	4.08	720	4.66	765	5.26	808	5.86	850	6.47
12,000	480	2.67	524	3.09	568	3.56	612	4.09	656	4.67	699	5.29	741	5.94	782	6.61	822	7.30	861	8.00
14,000	546	4.09	584	4.55	621	5.05	659	5.61	697	6.21	735	6.87	772	7.56	809	8.28	845	9.03	881	9.80
16,000	613	5.95	647	6.46	680	7.00	713	7.59	746	8.22	779	8.90	812	9.62	845	10.37	878	11.16	910	11.98
18,000	682	8.32	712	8.88	741	9.47	771	10.10	800	10.76	830	11.47	859	12.21	889	13.00	918	13.81	—	—
20,000	752	11.27	779	11.89	805	12.53	832	13.19	858	13.90	885	14.63	911	15.41	—	—	—	—	—	—
22,000	821	14.86	846	15.53	871	16.23	895	16.94	919	17.69	—	—	—	—	—	—	—	—	—	—
24,000	892	19.16	915	19.89	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Bhp — Brake Horsepower

Table 41 — Fan Performance — Power Exhaust
(Size 075-105 Units)

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
16,000	610	5.7	640	6.3	675	7.0	710	7.6	750	8.5	780	9.2	810	9.7	840	10.5	875	11.3	910	12.3
18,000	680	8.3	720	9.2	740	9.7	770	10.2	800	11.0	830	11.6	860	12.3	880	13.3	—	—	—	—
20,000	750	11.4	780	12.2	810	12.7	830	13.4	860	14.0	880	14.7	920	15.6	—	—	—	—	—	—
22,000	820	14.6	850	15.5	870	16.5	900	17.2	925	17.6	—	—	—	—	—	—	—	—	—	—
24,000	890	18.8	915	19.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Bhp — Brake Horsepower

Table 42 — Fan Performance — Return/Exhaust Fan (48ZC,ZL,ZR075-105 Units)

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	594	3.61	594	3.61	617	4.02	646	4.58	674	5.16	700	5.75	725	6.36	749	6.99	772	7.62	795	8.25
16,000	619	4.09	652	4.76	681	5.40	708	6.02	733	6.65	757	7.29	781	7.94	803	8.61	825	9.30	847	9.99
18,000	687	5.57	718	6.35	746	7.07	771	7.76	795	8.45	817	9.14	839	9.85	860	10.56	881	11.20	901	11.96
20,000	756	7.37	786	8.25	812	9.06	836	9.84	858	10.59	879	11.25	900	12.03	920	12.82	939	13.62	958	14.43
22,000	825	9.50	853	10.50	878	11.31	901	12.20	923	13.06	943	13.90	962	14.75	981	15.60	1000	16.46	1018	17.33
24,000	895	11.94	922	13.08	945	14.12	967	15.10	988	16.05	1007	16.99	1026	17.91	1044	18.83	1061	19.76	1079	20.69
26,000	965	14.94	990	16.21	1013	17.36	1034	18.46	1054	19.51	1073	20.53	1091	21.54	1108	22.54	1125	23.54	1141	24.54
28,000	1035	18.43	1059	19.81	1081	21.09	1101	22.29	1120	23.45	1138	24.57	1156	25.67	1172	26.76	1189	27.83	1204	28.91
30,000	1105	22.42	1128	23.93	1149	25.33	1169	26.65	1187	27.92	1205	29.14	1222	30.34	1238	31.51	1253	32.67	1269	33.83
32,000	1176	26.96	1198	28.59	1218	30.11	1237	31.55	1255	32.93	1272	34.26	1288	35.56	1304	36.83	1319	38.08	1333	39.32
34,000	1246	32.09	1267	33.83	1287	35.47	1305	37.03	1322	38.53	1339	39.97	1355	41.38	1370	42.75	1385	44.10	1399	45.43
36,000	1317	37.83	1337	39.69	1356	41.46	1374	43.14	1391	44.75	1407	46.31	—	—	—	—	—	—	—	—
38,000	1388	44.22	1407	46.21	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
	2.2		2.4		2.6		2.8		3.0		3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	816	8.89	836	9.52	856	10.15	874	10.67	892	11.31	910	11.94	926	12.57	942	13.19	958	13.80	973	14.42
16,000	867	10.59	887	11.31	907	12.05	926	12.78	944	13.52	961	14.25	978	14.98	995	15.71	1011	16.44	1026	17.16
18,000	921	12.74	940	13.52	959	14.33	977	15.13	995	15.95	1012	16.77	1029	17.59	1046	18.42	1062	19.24	1078	20.07
20,000	977	15.25	995	16.10	1013	16.96	1031	17.82	1048	18.70	1065	19.59	1081	20.49	1097	21.39	1113	22.30	1129	23.21
22,000	1035	18.21	1052	19.10	1069	20.01	1086	20.93	1103	21.86	1119	22.81	1135	23.76	1150	24.73	1166	25.71	1181	26.69
24,000	1095	21.62	1112	22.58	1128	23.54	1144	24.51	1159	25.49	1175	26.49	1190	27.50	1205	28.52	1220	29.55	1234	30.58
26,000	1157	25.54	1173	26.55	1188	27.57	1203	28.59	1218	29.64	1233	30.68	1247	31.74	1262	32.81	1276	33.89	1290	34.98
28,000	1220	29.98	1235	31.06	1249	32.14	1264	33.23	1278	34.32	1292	35.42	1306	36.53	1320	37.65	1334	38.78	1347	39.93
30,000	1283	34.98	1298	36.13	1312	37.28	1326	38.42	1340	39.58	1353	40.74	1367	41.92	1380	43.09	1393	44.27	1406	45.46
32,000	1348	40.55	1362	41.78	1375	43.00	1389	44.22	1402	45.45	1415	46.67	—	—	—	—	—	—	—	—
34,000	1413	46.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
36,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
38,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

NOTE: The 48ZC,ZL,ZR units comes standard with economizer and exhaust/return power exhaust.

Table 43 — Component Pressure Drops (in. wg)

(Size 030-050 Units)

COMPONENT	CFM							
	6,000	8,000	10,000	12,000	14,000	16,000	18,000	20,000
ECONOMIZER	0.06	0.09	0.12	0.16	0.21	0.25	0.29	0.35
INLET GUIDE VANES	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.10
FILTERS Pleated (2-in.) Bags With Prefilters*	 0.01 0.36	 0.01 0.38	 0.01 0.41	 0.02 0.51	 0.04 0.64	 0.04 0.77	 0.03 0.91	 0.02 1.01
POWER EXHAUST	0.07	0.08	0.09	0.13	0.18	0.24	0.32	0.41
LOW GAS HEAT	0.04	0.09	0.27	0.45	0.68	0.91	1.17	1.45
HIGH GAS HEAT	0.13	0.21	0.31	0.50	0.73	1.02	1.32	1.64
HIGH CAP COIL (040)	0.05	0.08	0.12	0.16	0.21	0.27	0.33	0.40
HIGH CAP COIL (050)	0.03	0.05	0.08	0.11	0.14	0.19	0.23	0.29

(Size 055-070 Units)

COMPONENT	CFM										
	10,000	12,000	14,000	16,000	18,000	20,000	22,000	24,000	26,000	28,000	30,000
ECONOMIZER	0.05	0.07	0.08	0.10	0.12	0.14	0.16	0.19	0.21	0.24	0.26
INLET GUIDE VANES	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.10	0.11	0.13	0.15
FILTERS Pleated (2-in.) Bags With Prefilters*	 0.00 0.45	 0.00 0.57	 0.00 0.68	 0.01 0.80	 0.02 0.94	 0.03 1.07	 0.03 1.23	 0.04 1.38	 0.04 —	 0.05 —	 0.05 —
POWER EXHAUST	0.02	0.04	0.06	0.10	0.13	0.17	0.21	0.25	0.29	0.33	0.38
LOW GAS HEAT	0.22	0.24	0.27	0.33	0.33	0.35	0.37	0.41	0.44	0.51	0.61
HIGH GAS HEAT	0.25	0.28	0.30	0.35	0.41	0.47	0.54	0.58	0.68	0.81	0.94
HIGH CAP COIL (055)	0.05	0.07	0.09	0.12	0.14	0.17	0.21	0.24	0.28	0.32	0.37
HIGH CAP COIL (060,070)	0.03	0.05	0.06	0.08	0.10	0.13	0.15	0.18	0.21	0.25	0.28

(Size 075-105 Units)

COMPONENT	CFM											
	15,000	18,000	20,000	22,000	24,000	26,000	28,000	30,000	34,000	36,000	38,000	40,000
ECONOMIZER†	0.10	0.12	0.14	0.16	0.19	0.21	0.23	0.26	0.31	0.34	0.37	0.40
INLET GUIDE VANES**	0.04	0.05	0.06	0.08	0.10	0.11	0.13	0.15	0.20	0.22	0.24	0.27
POWER EXHAUST††	0.08	0.13	0.17	0.21	0.25	0.29	0.33	0.38	0.46	0.51	0.55	0.60
LOW GAS HEAT	0.09	0.14	0.19	0.23	0.29	0.35	0.42	0.49	0.67	0.76	0.86	0.97
HIGH GAS HEAT	0.27	0.37	0.46	0.55	0.65	0.77	0.89	1.03	1.33	1.50	1.68	1.87
65% PLEATED FILTER	0.14	0.14	0.15	0.15	0.16	0.16	0.17	0.17	0.18	0.19	0.20	0.20
HIGH CAP COIL (075)	0.08	0.11	0.13	0.15	0.18	0.21	0.23	0.26	0.33	0.36	0.40	0.43
HIGH CAP COIL (090,105)	0.01	0.02	0.03	0.04	0.05	0.07	0.08	0.10	0.14	0.16	0.19	0.21

*Bag filter cfm limit is 25,000.
†The 48ZT,ZV,ZW units come standard with economizer and high-capacity power exhaust.
**Not available with airfoil supply fan.
††Available on vertical return and discharge units only.

NOTE: Power exhaust pressure drop does not need to be added to supply fan static pressure on high capacity power exhaust units (48ZT,ZV,ZW075-105).

Table 44 — Air Quantity Limits (Cfm) — Cooling

UNIT		MINIMUM	MAXIMUM
48ZA	030	9,000	15,000
	035	10,500	15,000
	040	12,000	20,000
	050	13,500	20,000
	055	15,000	25,000
	060	18,000	30,000
	070	21,000	30,000
48ZE,ZJ	030	6,000	15,000
	035	7,000	15,000
	040	8,000	20,000
	050	9,000	20,000
	055	10,000	25,000
	060	12,000	30,000
	070	14,000	30,000
48ZE,ZR,ZV	075	15,000	30,000
	090	17,000	34,000
	105	20,000	40,000
48ZA,ZC,ZT	075	21,000	30,000
	090	26,000	34,000
	105	30,000	40,000
48ZJ,ZL,ZW	075	15,000	30,000
	090	17,000	34,000
	105	20,000	40,000

Table 45 — Air Quantity Limits — Heating

UNIT	UNIT HEATING CAPACITY/SIZES	AIRFLOW RANGES	
		Min (Cfm)	Max (Cfm)*
48ZA,ZE,ZJ	030-050	6,094/ 8,864*	20,000/19,500
	055-070	12,188/14,625*	30,000/30,000
48ZA,ZC,ZT	075	21,000	30,000/30,000
	090	26,000	34,000/34,000
	105	30,000	40,000/37,000
48ZE,ZJ,ZL, ZR,ZV,ZW	075	15,000	30,000/30,000
	090	17,000	34,000/34,000
	105	20,000	40,000/37,000

*Low Heat/High Heat.

NOTE: Compare Minimum Airflow for Heating Application to Table 44. Ensure duct design and fan speed selection will provide required minimum airflow during heating cycle operation.

Manual Outdoor-Air Inlet Adjustments

MANUAL OUTDOOR-AIR DAMPER (Units Without Economizer Option) — All units except those equipped with a factory-installed economizer have a manual outdoor-air damper to provide ventilation air. This damper can be preset to admit up to 25% outdoor-air into the return-air compartment. The manual outside air dampers are located behind each outside air hood. On sizes 030-050, there is one damper on each side of the unit. On sizes 055-105, there are two dampers on the end of the unit. To adjust, loosen the blade limiter screws as shown in Fig. 103 and move the damper to the desired position. Then retighten the blade limiter screws to secure the damper. See Fig. 103. (To make this adjustment, it is necessary to remove the screens covering the hood opening and make adjustments from inside the hood.)

Economizer Settings (48ZA,ZC,ZT Only)

NOTE: The following text applies to CV units only. For economizer operation on VAV and PIC units, refer to the appropriate Controls and Troubleshooting literature.

The economizer system consists of a combination actuator/economizer control, an enthalpy sensor, and a mixed-air temperature sensor. The actuator/economizer control is located in the return-air section and is accessed by opening the access panel labeled FILTER SECTION.

COMPONENT	LOCATION
Actuator Control	Filter Section
Mixed-Air Thermistor	On Filter Rack
Enthalpy	Behind Filters in the Economizer Hood

ENTHALPY SENSOR (See Fig. 104) — This sensor is located behind the filters in the end economizer hood (the upper hood on sizes 055-105). See Fig. 105.

For maximum benefit of outdoor air, set enthalpy sensor control to the A setting. At this setting, when the relative humidity is 50%, and the outdoor-air is below 74 F, the sensor's relay contacts will be closed. See Fig. 106 and 107.

NOTE: Enthalpy control setting dial is on the economizer motor.

MIXED-AIR THERMISTOR (MAT) — This control set point adjustment is on the top of the economizer motor. This motor is located in the return-air section, and is accessed by opening the access panel marked FILTER SECTION. See Fig. 108. Set MAT set point adjustment dial to the desired setting. The factory setting is 55 F ± 5 F (12.8 C ± 2.8° C); range is 40 to 90 F (4.4 to 32.2 C). The MAT is located on the filter rack.

DAMPER VENT POSITION — The position setting adjustment is located on the cover of the economizer motor. See Fig. 108. Adjust by setting the fan switch at ON position (continuous fan operation), and setting the system selector switch to OFF position. Then turn adjustment screw slowly until the dampers assume the desired vent position. Do not manually operate the damper motor; damage to the motor may result.

ECONOMIZER DAMPER LINKAGE ADJUSTMENT — When replacing economizer damper motors, or if the linkage has come loose, it is critical that the linkages be adjusted correctly. They are sensitive, and incorrect adjustment can cause the motor to stall.

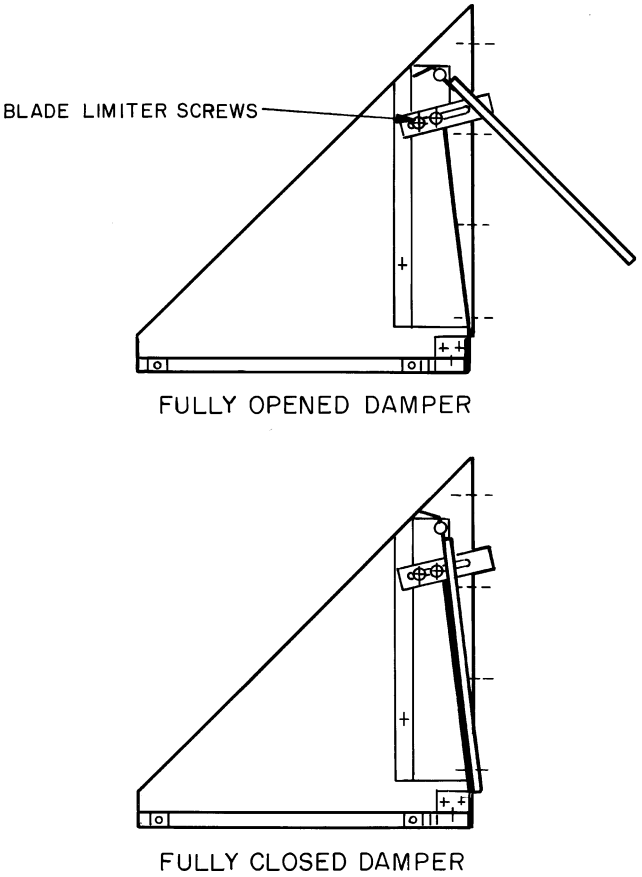


Fig. 103 — Outdoor-Air Damper Adjustment (Inside of Hood Shown)

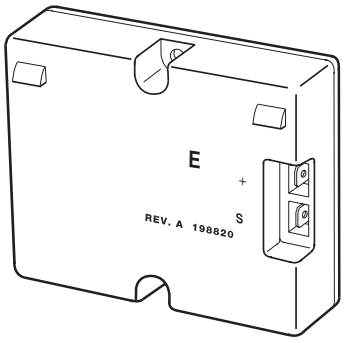


Fig. 104 — Enthalpy Sensor (Part No. 50DJ902321)

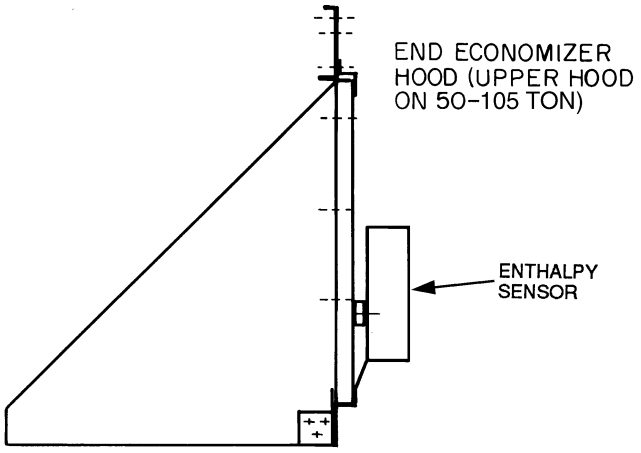


Fig. 105 — Enthalpy Sensor Location

CONTROL CURVE	CONTROL POINT (Approx Deg) AT 50% RH
A	73
B	68
C	63
D	58

RH — Relative Humidity

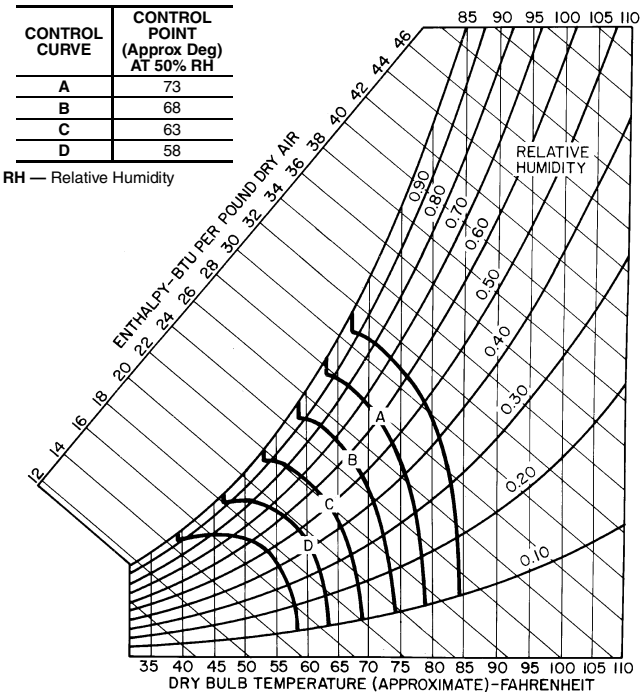
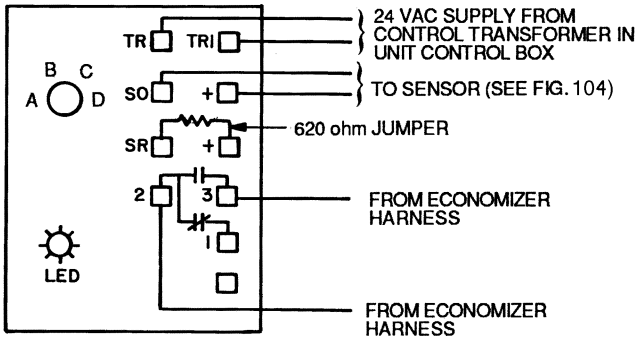


Fig. 106 — Psychrometric Chart for Enthalpy Control



NOTES:
1. Switches shown in high enthalpy state. Terminals 2 and 3 close on enthalpy decrease.
2. When standard economizer is used with accessory different enthalpy sensor, set enthalpy control to "D" setting.

Fig. 107 — Wiring Connections for Solid-State Enthalpy Sensor

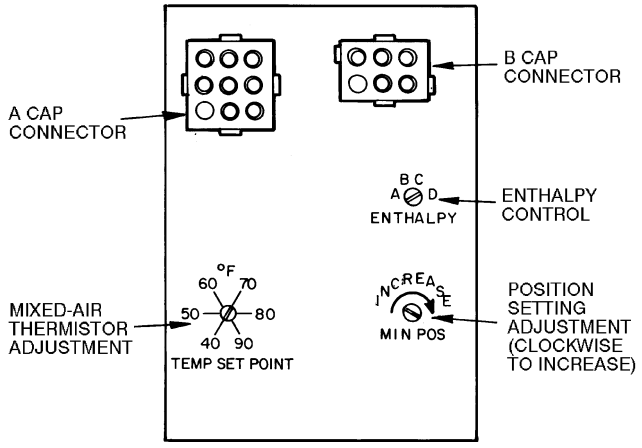


Fig. 108 — Mixed-Air Thermistor and Economizer Position Setting Adjustments (Top of Economizer Motor)

START-UP

For 48ZA,ZC,ZT (constant volume) units, complete the Initial Check and Start-Up sections in this book.

For 48ZE,ZR,ZV (variable air volume) units, refer to the separate Controls and Troubleshooting provided with the unit for start-up and controls information.

For 48ZJ,ZL,ZW (PIC) units, refer to the separate Controls and Troubleshooting provided with the unit for start-up and controls information.

Initial Check (Constant Volume Units)

IMPORTANT: Do not attempt to start unit, even momentarily, until all items on the Start-Up Checklist and the following steps have been completed.

1. Verify unit has been installed per the Installation section of this literature.
2. Certify that all auxiliary components (thermostats, sensors, controls, etc.) have been installed and wired to the control boxes per these instructions, and the unit wiring label diagrams.
3. Verify that static pressure hoses (if applicable) are properly attached, routed, and free from pinches or crimps that may affect proper control operation.
4. Set any control configurations that are required (field-installed accessories, etc.).
5. Enter unit set points (if applicable).
6. Enter occupancy schedules (if applicable).
7. Verify that control time periods programmed meet current requirements.
8. Check all electrical connections to be sure they are tight.

General

1. Close the control circuit breaker (CCB), which will energize the control circuit and the crankcase heaters.
2. Complete Pre-Start-Up section items and Start-Up Checklist.

Operating Sequences — Base unit (48ZA,ZC,ZT) operating sequences are presented below. Refer to unit Controls and Troubleshooting literature for details on VAV and PIC controls operation.

COOLING, UNITS WITHOUT ECONOMIZER — Unit power ON, system selector switch set at COOL or AUTO., fan switch at AUTO., thermostat at setting below room temperature.

Y1 on the thermostat subbase closes, energizing indoor fan and return fan (if equipped) and energizing compressor no. 1 as first stage of cooling. If cooling load cannot be satisfied with only first-stage cooling, Y2 on the thermostat will close energizing compressor no. 2.

Size 030 and 035 Units — Condenser fan no. 1 is energized with compressor no. 1. The no. 1 fan runs continuously while the unit is in mechanical cooling. The no. 2 fan is staged for head pressure control.

Check cooling effects at a thermostat setting below room temperature. Reset thermostat at a setting above room temperature. Compressors will shut off.

Size 040 and 050 Units — Condenser fan no. 1 is energized with compressor no. 1. Condenser fan no. 3 is energized with compressor no. 2. The no. 2 fan is staged for head pressure control.

Check cooling effects at a setting below room temperature. Reset thermostat at a setting above room temperature. Compressors will shut off.

Size 055-075 Units — Condenser fan no. 1 is energized with compressor no. 1. Condenser fan no. 2 (and no. 4 on size 070,075) is energized with compressor no. 2. Condenser fans 3 and 4 (sizes 055 and 060) or 3 and 5 (size 070,075) are staged for head pressure control.

Check cooling effects at a setting below room temperature. Reset thermostat at a setting above room temperature. Compressor and indoor fan will shut off.

Size 090 and 105 Units — Condenser fans 1 and 3 are energized with circuit 1. Condenser fans 2 and 4 are energized with circuit 2. Condenser fans 5 and 6 are staged for head pressure control.

Check cooling effects at a setting below room temperature. Reset thermostat at a setting above room temperature. Compressor and indoor fan will shut off.

HEATING, UNITS WITH DIRECT SPARK IGNITION — All 48ZA,ZC,ZT units have 2 stages of heating control. Low-fire sizes 030-050 have one heating section, equipped with a 2-stage gas valve. High-fire sizes 030-050 and low-fire sizes 055-105 have 2 gas heat sections, each equipped with 2-stage gas valves. High-fire sizes 055-105 have 3 gas heat sections, each equipped with 2-stage gas valves. Each individual section operates in the same manner.

Unit Without Economizer — Unit power ON, system selector switch at HEAT or AUTO, thermostat heat set point at a setting above room temperature:

When thermostat contact W1 closes (Stage 1 heating), supply fan is energized. Control power is sent to W terminal on each IGC (integrated gas controller) board in each gas section. An LED (light-emitting diode) on each IGC board will be on during normal operation. A check is made to ensure that the rollout switch and the limit switch are closed and the induced-draft motor is not running. The induced-draft motor is then energized and when speed is proven by the Hall Effect sensor on the motor, the ignition activation period begins. The first-stage solenoids on each section's main gas valve are energized and the Direct Spark Ignition process is initiated. The burners will ignite within 5 seconds. The IGC boards will continue to monitor the condition of the rollout and limit switches, the Hall Effect sensor and the flame sensor. Stage 1 heating cycle will be maintained for minimum of one minute after initiation by W1 closure, even if W1 opens within one minute.

When additional heat is required, thermostat contact W2 closes (Stage 2 heating) and control power is sent to the second-stage solenoid on each heating section's main gas valve. Each heating section will then operate at full-fire stage.

As the space temperature rises above thermostat W2 setting, thermostat contact W2 opens, second-stage heating is deenergized and each section's second-stage gas valve solenoid is deenergized. As the space temperature rises above thermostat W1 setting, thermostat contact W1 opens, all first-stage gas valve solenoids are deenergized, ending heating system operation. The supply fan is deenergized.

Unit with Economizer — Unit power ON, system selector switch at HEAT or AUTO, fan switch at AUTO, thermostat heat set point at a setting above room temperature:

When thermostat contact W1 closes (Stage 1 heating), supply fan is energized and economizer opens to Minimum Damper Position. Control power is sent to W terminal on each IGC (integrated gas controller) board in each gas section. An LED (light-emitting diode) on each IGC board will be on during normal operation. A check is made to ensure that the rollout switch and the limit switch are closed and the induced-draft motor is not running. The induced-draft motor is then energized and when speed is proven by the Hall Effect sensor on the motor, the ignition activation period begins. The first-stage solenoids on each section's main gas valve are energized and the Direct Spark Ignition process is initiated. The burners will ignite within 5 seconds. The IGC boards will continue to monitor the condition of the rollout and limit switches, the Hall Effect sensor and the flame sensor. Stage 1 heating cycle will be maintained for minimum of one minute after initiation by W1 closure, even if W1 opens within one minute.

When additional heat is required, thermostat contact W2 closes (Stage 2 heating) and control power is sent to the second-stage solenoid on each heating section's main gas valve. Each heating section will then operate at high-fire stage.

As the space temperature rises above thermostat W2 setting, second-stage heating is deenergized and each section's second-stage gas valve solenoid is deenergized. As the space temperature rises above thermostat W1 setting, all first-stage gas valve solenoids are deenergized, ending heating system operation. The supply fan is deenergized and the economizer outside air dampers return to closed position.

IGC Re-Ignition and LED Alarms — If the burners do not light successfully on the first attempt, there is a 22-second delay before another 5-second attempt. If the burners still do not light, this sequence is repeated for 15 minutes. After the 15 minutes have elapsed, if the burners have not been lit, heating is locked out. To reset the control, either open and close the thermostat W1 contacts (in the occupied space) or open and close the control circuit breaker (CCB) (in the 48ZA,ZC,ZT unit's main control box).

An LED indicator is provided on each IGC board to monitor operation. The IGC boards are accessed by opening the gas section access door. The IGC boards are located on the side panels in the unit's gas section. During normal operation, the LED is continuously on. See Table 46 for IGC error codes.

Table 46 — IGC Control Board LED Alarms

INDICATION	ERROR MODE
ON	Normal Operation
OFF	Hardware Failure
1 FLASH	Fan ON/OFF Delay Modified
2 FLASHES	Limit Switch Fault
3 FLASHES	Flame Sense Fault
4 FLASHES	4 Consecutive Limit Switch Faults
5 FLASHES	Ignition Lockout Fault
6 FLASHES	Induced Draft Motor Fault
7 FLASHES	Rollout Switch Fault
8 FLASHES	Internal Control Fault
9 FLASHES	Software Lockout

LEGEND

IGC — Integrated Gas Unit Controller
LED — Light-Emitting Diode

NOTES:
1. There is a 3-second pause between error code displays.
2. If more than one error code exists, all applicable error codes will be displayed in numerical sequence.
3. Error codes on the IGC will be lost if power to the unit is interrupted.

HEATING, UNITS WITH STAGED GAS CONTROL — The Staged Gas Control option adds the capability to control the gas heating system to a specified Supply Air Temperature Set Point for purposes of tempering a cool mixed-air condition. The gas heating systems employ multiple heating sections. Each section is equipped with a two-stage gas valve. The gas valves are sequenced by a factory-installed staged gas controller (SGC) as required to maintain the user-specified Supply Air Set Point. Up to nine stages of heating control are available, based on quantity and heating capacity sizes of the individual heat exchanger sections provided in the base unit. In addition to providing system control for tempering heat operation, the SGC also controls Demand Heat sequences for both First-Stage (W1) and Second-Stage (W2 or full-fire) operation.

Tempering of supply air is desirable when rooftop units are operating in ventilation mode (economizer only operation) at low outdoor temperatures. At low outdoor temperatures, the mixed air temperature (combination of return-from-space temperature and outdoor/ventilation air temperature) may become too low for the comfort of the occupants or for the terminal reheat systems. The tempering function adds incremental steps of heat capacity to raise the temperature of the mixed air up to levels suitable for direct admission into the occupied space or to levels consistent with reheat capabilities of the space terminals.

The SGC outputs consist of six relays (K1 through K6) which control the individual gas valves.

System Components — The new heating control system consists of the components in Table 47.

Control Inputs/Outputs — The heating system controller (SGC) has the inputs shown in Table 48.

Operating Modes — The SGC will operate the unit in one of the following operating modes:

- no mode
- Cooling Mode
- Heat1 Mode
- Heat2 Mode

No Mode — In this mode, none of the heat stages are turned on. No mode occurs if the Cool, Heat or Fan inputs are off or the Cool input(s) are on.

Tempering (Cool) Mode — In this mode, the SGC tempers in incoming supply air to maintain the cooling supply air set point. Tempering mode occurs if the Fan input is ON, the Dehumidify input is selected, and all Cool and Heat inputs are off.

When the SGC determines that the fan is on and the base unit control is not calling for heat or mechanical cooling, the SGC will stage heat to maintain the cooling set point which is set on the CLSASP potentiometer of the SGC. For VAV units, this set point should be slightly below the supply air set point of the base unit VAV control. Note that the supply air temperature will still be in the "cooling range".

Heat1 Mode — In this mode, heat is staged to control supply air temperature to HTSASP. Heat1 mode occurs only if Heat1 is ON and Heat2 is OFF and Cool1 and Cool2 are OFF.

When the base unit control calls for first stage of heat the SGC will stage heat to maintain the heating set point which is set on the potentiometer of the SGC. On VAV systems, the HIR will be energized to command the zone terminals to open to maintain minimum heating airflow.

Heat2 Mode — Heat2 mode is used on PIC applications as they have 2 heat stages on the base unit control. VAV units have only 1 heat stage and will not operate under Heat2 mode.

In this mode, when the base unit calls for the second stage of heat, the SGC will turn on all available heat stages. This mode only occurs if Heat1 and Heat2 are ON and Cool1 and Cool2 are OFF.

COOLING, UNITS WITH ECONOMIZER — With subbase switch set at COOL and fan switch set at AUTO., indoor fan and return fan (if equipped) are energized when Y1 on thermostat closes. If enthalpy is "good" (below setting on enthalpy switch), the economizer outside air dampers will modulate open to satisfy the cooling requirement. If outside air alone will not meet the cooling requirements, Y2 on the thermostat will close, energizing compressor no. 1 to work in conjunction with the modulating economizer to meet the cooling requirement. While the unit is operating using outside air, compressor no. 2 cannot be energized.

If enthalpy is "not good" (above setting on enthalpy switch), the economizer outside air dampers move to the minimum (ventilation) position, and condenser fans cycle on and off as described in Cooling, Units Without Economizer.

NOTE: If fan switch is ON and the room thermostat is satisfied, the outside air dampers move to the minimum position.

Power exhaust operation is linked to economizer damper position. See the following sections for power exhaust sequence of operation.

Table 47 — Staged Gas Control Components

ITEM	FUNCTION	LOCATION
Heating Controller (SGC)	Logic and Output Relays	Heating section
Supply Air Thermistors (SAT)	Sense unit leaving air temperature	Supply duct (factory-provided, field-installed)
Limit Switch Thermistor (LIMTTEMP)	Sense the temperature at the limit switch	Heating section, next to limit switch (factory-installed)
Cooling Supply Air Set Point Potentiometer (CLSASP)	Specify set point for tempering heat control Set Point Range: 35 to 70 F	Heating section, next to SGC
Heating Supply Air Set Point Potentiometer (HTSASP)	Specify set point for First-Stage Heating control Set Point Range: 80 to 125 F	Heating section, next to SGC
Air Flow Switch (AFS)	Prove Supply Fan operation	Fan supply air plenum (factory-installed)

Table 48 — Staged Gas Control Inputs

INPUT	DESCRIPTION
Cool1	Relay in parallel with Compressor No. 1 contactor
Cool2	Relay in parallel with Compressor No. 2 contactor
Heat1	24V input from Base Unit control
Heat2	24V input from Base Unit control
Fan	Air proving switch (contact closure on rise in static pressure)
Cool Supply Set Point	Potentiometer (range 35-70 F)
Heat Supply Set Point	Potentiometer (range 80-125 F)
Supply Air Thermistor (1, 2 and 3)	Field-installed in supply ductwork (P/N HH79NZ033)
Limit Switch Thermistor	Next to the lower limit switch (P/N HH79NZ033)

VENTILATION-AIR CIRCULATION (Continuous Fan) — Turn unit power on. Set system selector switch at OFF, HEAT, or COOL position, and set fan switch at ON position.

Evaporator-fan contactor is energized through the switch on the thermostat and the evaporator fan runs continuously. The damper moves to the minimum position.

AUTOMATIC CHANGEOVER USING AUTOMATIC CHANGEOVER THERMOSTAT — Turn unit power on. Set system selector switch at AUTO. position.

When the temperature of the conditioned space rises to the cooling selector lever setting, unit automatically switches to Cooling mode. When the temperature of the conditioned space falls to the heating selector switch setting, unit automatically changes to Heating mode. The thermostat is interlocked so that cooling and heating systems do not operate at the same time. There is a deadband between Heating and Cooling modes.

POWER EXHAUST — The power exhaust assembly consists of two parallel and independent belt-drive forward curve fans. The fans, motors, and drives are located over the return-air opening of the unit, in a plenum beneath the outside air intake plenum. The fans discharge horizontally out the back of the unit through individual barometric backdraft dampers with hoods. Operation is interlocked with economizer operation.

NON-MODULATING POWER EXHAUST (CV Units Only) — Operation of the non-modulating power exhaust is 2-stage, dictated by economizer position.

As the economizer actuator opens past 35% open, auxiliary switch DMS1 (in the economizer actuator) closes, energizing exhaust fan contactor PEC1. Fan motor no. 1 starts and runs. The power exhaust operates at 50% of available exhaust airflow.

As the economizer actuator opens further (to approximately 75% open), auxiliary switch DMS2 closes, energizing fan contactor PEC2. Fan motor no. 2 starts and runs. The power exhaust operates at 100% of available airflow.

Switch DMS2 opens as damper closes below 65% open.

Switch DMS1 opens as damper closes below 25% open.

MODULATING POWER EXHAUST (CV Units Only) — Fan no. 1 is equipped with a variable position discharge damper located in the outlet of the fan housing. This damper is controlled by an actuator (PEDM), based on signals from the building pressure differential pressure switch (DPS). Available range on the DPS is ± 0.50 in. wg (125 Pa), which is adjustable. Building pressure is sensed by a pick-up (field-supplied and -installed) located in the occupied space.

Operation of the modulating power exhaust is a combination modulating/staged control, with fan no. 1 providing modulating control from 0 to 100%, and fan no. 2 being staged On/Off according to damper position on fan no.1.

As the economizer actuator opens past 25% open, auxiliary switch DMS1 closes, energizing fan contactor PEC1. Fan motor no. 1 starts and runs.

The capacity of fan no. 1 is controlled by the position of the outlet damper. As building pressure increases above set point, the DPS will close its contact and drive the power exhaust damper motor (PEDM) open until set point is achieved. The DPS then opens its control contacts and PEDM maintains current position.

When space demand moves PEDM to 90% of full-open position, auxiliary switch PEDMS closes, energizing fan contactor PEC2. Fan motor no. 2 starts and runs. Increased exhaust airflow will lower space pressure, causing DPS to drive PEDM back toward its closed position, until set point is achieved.

If space pressure decreases until PEDM position is reduced to 10% of open position, PEDMS will open, deenergizing fan contactor PEC2 and shutting off fan no. 2.

RETURN/EXHAUST FAN POWER EXHAUST (CV Units With Return/Exhaust Fan Only) — The 48ZC units have a return/exhaust fan power exhaust. The return/exhaust fan power exhaust assembly consists of one belt-drive plenum fan. The fan, motor and drive are located over the return air opening of the unit, in a plenum beneath the outside air intake plenum. The plenum fan pressurizes the plenum section so that the air can either be discharged horizontally out the back of the unit through motorized exhaust damper with hood, and/or discharged through the return air section of the economizer.

The return/exhaust fan is equipped with a variable frequency drive (RE VFD), matched to the motor size. The VFD output is determined by the VFD's internal PID logic in response to the actual space pressure as monitored by the Mixing Box Pressure Transducer (MBPT). Set point for MBPT control is established at the RE VFD (factory set up). Mixing box pressure is sensed by a pick-up located in the filter section and connected to the transducer by $^1/_4$-in. tubing (factory installed).

The return/exhaust fan is also equipped with a motorized power exhaust damper at the end of the unit. This damper is controlled by a motor actuator (PEDM), based on signals from the building pressure switch (BPS). Available range on the BPS is ± 0.25 in. wg (64 Pa), which is adjustable. Building pressure is sensed by a pick-up (field-supplied and -installed) located in the occupied space. The BPS will sense the occupied space pressure and control the power exhaust damper to open or close.

The return/exhaust fan will be turn on/off simultaneously with the supply fan, and the fan speed will change automatically to meet the return/exhaust air volume needs.

Operation of the return/exhaust fan is controlled by the MBPT through the RE VFD. The MBPT will maintain the plenum fan to run at certain speed in order to keep the mixing box pressure set point. When the power exhaust damper is closed, all return air will be discharged through the economizer into the mixing box. The set point is normally a slightly negative pressure in the mixing box so that certain amount of outside air can brought in. During the situation when the supply fan speed is increased, or when economizer opens, the MBPT will command the RE VFD to increase the return/exhaust fan speed in order to maintain the set point. When the power exhaust is open, the return air will be discharged partially through the power exhaust damper to the outside and returned partially through the economizer. The return/exhaust fan usually will increase speed during the situation when the power exhaust damper is open.

For detailed set up instructions, see the Controls Operation and Troubleshooting book.

HIGH-CAPACITY MODULATING POWER EXHAUST — The high-capacity modulating power exhaust assembly consists of two parallel, independent, belt-drive, large-diameter, forward-curve fans. The fans, motors, and drives are located in a cabinet extension (not over the return-air opening of the unit), in a plenum beneath the outside-air intake plenum. The fans discharge horizontally out the back of the unit through individual barometric backdraft dampers with hoods. Operation is interlocked with economizer operation. Space pressure is monitored by a factory-installed differential pressure transducer.

Modulating power exhaust is provided on 48ZV,ZW units. The return duct openings are located on the left-hand side of the unit. The exhaust air exits the unit out the back.

Control of the high-capacity modulating power exhaust system is accomplished via a combination modulated capacity fan/staged fan. Modulation is provided by a variable frequency drive controlling the direct output to fan no. 1 and controlling the ON/OFF status of fan no. 2.

Power exhaust (PE) fan no. 1 is equipped with a variable frequency drive, matched to the motor size. The VFD output is determined by the VFD's internal PID logic in response to actual space pressure as monitored by the Building Pressure (BP) transducer. Set point for BP control is established at the PE VFD. Available set point range is –0.5 to +0.50 in. wg. Building pressure is sensed by a pick-up (field-supplied and -installed) located in the occupied space and connected to the BP transducer by $^1/_4$-in. tubing (field-supplied and -installed).

Operation of the modulating power exhaust is a combination modulating and staged control. Power exhaust fan no. 1 provides modulating control from 0 to 50% of total exhaust capability, and PE fan no. 2 is staged On/Off (for a step of 50% of total exhaust capability) according to VFD output level on PE fan no. 1.

As the economizer actuator opens past 35% open, auxiliary switch DMS1 closes, energizing fan contactor PEC1. PE VFD and PE fan motor no. 1 starts and runs.

Capacity of PE fan no. 1 is controlled by the output level from the PE VFD. As building pressure increases above set point, the VFD logic will increase the output level to PE fan motor no. 1 until set point is reachieved.

When space demand moves PE VFD output to 100% (60 Hz), VFD internal relay closes, energizing fan contactor PEC2. PE fan motor no. 2 starts and runs. Increased exhaust airflow will lower space pressure causing PE VFD to reduce its output to PE fan motor no. 1 until set point is reachieved.

If space pressure decreases until PE VFD output is reduced to 25% of maximum output (15 Hz), VFD internal relay will open, deenergizing fan contactor PEC2 and shutting off PE fan no. 2.

Head Pressure Control — All units have a fan cycling thermostat which cycles the no. 2 condenser fan. This switch opens at 70 F ± 3 F (21.1 C ± 1.7° C) and closes at 80 F ± 3 F (26.7 C ± 1.7 C). This allows the unit to operate down to 45 F (7.2 C) outdoor ambient temperature.

NOTE: Accessory –20 F (–29 C) Low Ambient Kit is available, which allows mechanical cooling to –20 F (–29 C) outdoor ambient. See accessory installation instructions for mounting and operation details.

High-Capacity Power Exhaust Building Pressure Control Set Point (48ZV,ZW Units Only) — For instructions on adjusting BP Control set points on PIC units, refer to the Controls and Troubleshooting book for these units.

The power exhaust VFD will modulate the power exhaust fan motor no. 1 speed and also stage on/off power exhaust fan motor no. 2 to maintain the building pressure. Set point for the BP control is set at the PE VFD, using the display keyboard on the front of the PE VFD enclosure. See Fig. 109.

NOTE: The VFD will always provide the proper phase sequence to the supply-fan motor. The supply-fan motor operates in proper rotation regardless of the phase sequence to the unit. If, upon start-up, the outdoor fans operate backwards but the supply fan operates in the correct direction, reverse any two leads to the main terminal block. All fans will then operate in the correct direction.

To set the building static pressure, perform the following steps. The factory setting is 0 in. wg. The duct transducer has a range from –0.5 to +0.5 in. wg. The transducer output is 4 to 20 mA, therefore, –0.5 to +0.5 in. wg is proportional to the 4 to 20 mA and must be expressed to the PE VFD in terms of percentage of the frequency range. Refer to Table 49. The set point value is a percentage of the maximum output frequency. Locate the building static pressure closest to that desired and use the corresponding set point value. If necessary, interpolation between duct static pressures is permissible.

DETERMINE PE VFD SET POINT — The unit of measure for the Building Pressure set point at the PE VFD is output frequency (Hz), representing the desired BP set point (BPSP) in inches of water gage (in. wg). To convert desired BPSP into the PE VFD set point, refer to Table 49. Locate the pressure value in the table closest to the desired BPSP for this installation and use the corresponding PE VFD set point (Hz) value. If necessary, interpolation between duct static pressure values is permissible.

ADJUST PE VFD SET POINT — To adjust the PE VFD set point, the PE VFD must be powered. Since it is located in the indoor section of the unit, use caution to ensure that the service access door is blocked open and will not close suddenly.

Change PE VFD set point according to Table 50 shown on page 102.

The economizer end switch can be bypassed by placing a jumper from PEC1-DU1 to PEC-C1 during unit set up (the supply fan must be running and the IFC must be energized).

Table 49 — Power Exhaust and Return/Exhaust VFD Set Point (Frequency Command) for Building Pressure

PRESSURE (in. wg)	VFD SET POINT	CONTROL SIGNAL (mA)	PRESSURE (in. wg)	VFD SET POINT	CONTROL SIGNAL (mA)
0.50	0.0	4.00	**0.00**	30.0	12.00
0.45	3.0	4.80	**–0.05**	33.0	12.80
0.40	6.0	5.60	**–0.10**	36.0	13.60
0.35	9.0	6.40	**–0.15**	39.0	14.40
0.30	12.0	7.20	**–0.20**	42.0	15.20
0.25	15.0	8.00	**–0.25**	45.0	16.00
0.20	18.0	8.80	**–0.30**	48.0	16.80
0.15	21.0	9.60	**–0.35**	51.0	17.60
0.10	24.0	10.40	**–0.40**	54.0	18.40
0.05	27.0	11.20	**–0.45**	57.0	19.20
			–0.50	60.0	20.00

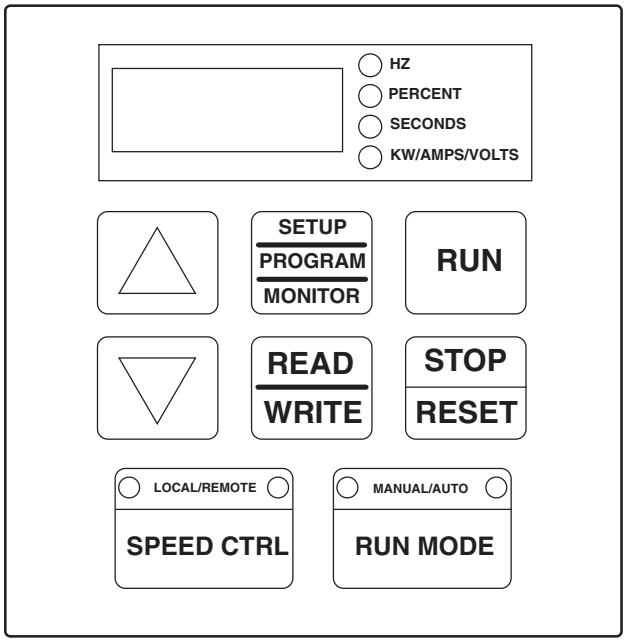


Fig. 109 — Power Exhaust Variable Frequency Drive (TOSVERT130-E3) Keypad

SERVICE

Optional Staged Gas Unit Control

ACCESSORY NAVIGATOR™ DISPLAY — The accessory Navigator display module provides the user interface to the Staged Gas control system and is required for all staged gas control units. See Fig. 110. The display has up and down arrow keys, an ESC key, and an ENTER key. These keys are used to navigate through the different levels of the display structure. See Table 51. Press the ESC key until the display is blank to move through the top 11 mode levels indicated by LEDs on the left side of the display.

Pressing the ESC and ENTER keys simultaneously will scroll a text description across the display indicating the full meaning of each display acronym. Pressing the ESC and ENTER keys when the display is blank (Mode LED level) will return the display to its default menu of rotating display items. In addition, the password will be disabled requiring that it be entered again before changes can be made to password protected items.

When a specific item is located, the display will flash showing the operator, item, item value, and then followed by the item units (if any). Press the ENTER key to stop the display at the item value. Items in the Configuration and Service Test modes are password protected. The display will flash PASS and WORD when required. Use the ENTER and arrow keys to enter the 4 digits of the password. The default password is 1111.

Changing item values or testing outputs is accomplished in the same manner. Locate and display the desired item. Press the ENTER key to stop the display at the item value. Press the ENTER key again so that the item value flashes. Use the arrow keys to change the value or state of an item and press the ENTER key to accept it. Press the ESC key and the item, value, or units display will resume. Repeat the process as required for other items. For complete information on using the accessory Navigator display, refer to the Controls Operation and Troubleshooting literature.

CLEARING UNIT ALARMS — The unit alarms can be cleared through Navigator display. To check the current alarms, enter the Alarms menu. The first submenu is the CRNT submenu. The CRNT function displays the list of current alarms (maximum of 25). The second submenu item is the RCRN (Reset All Current Alarms) function. Press ENTER to reset the current alarms. The next submenu item, HIST, displays the list of cleared alarms (maximum of 20). HIST function can be cleared with the RHIS function.

Table 50 — Changing the Power Exhaust VFD (TOSVERT130-E3) Set Point (Frequency Command)*

KEY OPERATION	LED MESSAGE	EXPLANATION
	XX.X or OFF	Standard Monitor Mode (output frequency). If drive is disabled, display will read "OFF." If enabled, display will show current output frequency.
↓	60.0	Pressing arrow key once will display the current frequency set point
↓↑	45.0 (flashing)	Pressing up/down arrow keys changes the desired set point
READ/WRITE	FC and 45.0 (flashing)	When read/write is pressed, the parameter name (FC) and the new value (45.0) will alternately flash to indicate that the new value has been stored. After 2 cycles, the display will return to the standard monitor mode.
	XX.X or OFF	Standard Monitor Mode (output frequency). If drive is disabled, display will read "OFF." If enabled, display will show current output frequency.

*Choose set point from Table 49 according to desired duct pressure.

Table 51 — Navigator Display Menu Structure

RUN STATUS	SERVICE TEST	TEMPERATURES	PRESSURES	SET POINTS	INPUTS	OUTPUTS	CONFIGURATION	TIME CLOCK	OPERATING MODES	ALARMS
Auto Display (VIEW)	SERVICE TEST	SUPPLY AIR TEMPERATURE	N/A	SETPOINT SELECT	COOL INPUT#1	HEAT OUTPUT 1	Display Configuration (DISP)	Time (DAY)	N/A	Currently Active Alarms (CRNT)
Software Version (VERS)	HEAT OUTPUT#1	SUPPLY AIR TEMPERATURE 1		COOLING SETPOINT 1	COOL INPUT#2	HEAT OUTPUT 2	CCN Configuration (CCN)	Date (DATE)		Reset all Current Alarms (RCRN)
	HEAT OUTPUT#2	SUPPLY AIR TEMPERATURE 2		COOLING SETPOINT 2	HEAT INPUT#1	HEAT OUTPUT 3	Stage Gas Configuration (CNFG)	Occupancy and Unoccupancy Schedule Number (SCH.D)		Alarm History (HIST)
	HEAT OUTPUT#3	SUPPLY AIR TEMPERATURE 3		HEATING SETPOINT 1	HEAT INPUT#2	HEAT OUTPUT 4				Reset Alarm History (RHIS)
	HEAT OUTPUT#4	LIMIT SWITCH TEMPERATURE		HEATING SETPOINT 2	SUPPLY FAN STATUS	HEAT OUTPUT 5				
	HEAT OUTPUT#5				DEHUMIDIFY INPUT	HEAT OUTPUT 6				
	HEAT OUTPUT#6									

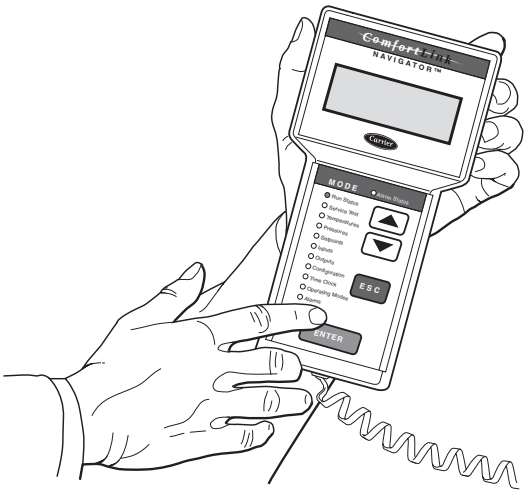


Fig. 110 — Accessory Navigator™ Display

Service Access — All unit components can be reached through clearly labeled hinged access doors. These doors are not equipped with tiebacks, so if heavy duty servicing is needed, either remove them or prop them open to prevent accidental closure.

Each door is held closed with 3 latches. The latches are secured to the unit with a single $^1/_4$-in. –20 x $^1/_2$-in. long bolt. See Fig. 111.

To open, loosen the latch bolt using a $^7/_{16}$-in. wrench. Pivot the latch so it is not in contact with the door. Open the door. To shut, reverse the above procedure.

NOTE: Disassembly of the top cover may be required under special service circumstances. It is very important that the orientation and position of the top cover be marked on the unit prior to disassembly. This will allow proper replacement of the top cover onto the unit and prevent rainwater from leaking into the unit.

IMPORTANT: After servicing is completed, make sure door is closed and relatched properly, and that the latches are tight. Failure to do this can result in water leakage into the indoor-air section of the unit.

COMPRESSORS

Sizes 030-050 — Access to the compressors is through the doors on the condenser end of the unit. This door also provides access to the discharge and suction service valves, the crankcase heaters, and the high- and low-pressure switches. Compressor no. 1 is always the compressor on the left when facing main control box.

Sizes 055-105 — The oil pump end (compressor access) of each compressor is readily accessible from sides of unit as shown in Fig. 112. Access the motor end of the compressor through the condenser end of the unit or by removing compressor.

LIQUID SERVICE VALVES, FILTER DRIERS, AND SIGHT GLASSES

Sizes 030-050 — Access to these components is through the access panel on the right side of the unit. See Fig. 112. There is also a Schrader port in each suction line that is accessible through this same panel. When charging unit, route service line through the round holes and replace panel to minimize air bypass.

Sizes 055-105 — Access to these components is from the side of the unit as shown in Fig. 112.

SUPPLY-FAN MOTORS, PULLEYS, AND BELTS — Access to these components is through the 2 doors labeled FAN SECTION on each side of the unit.

POWER EXHAUST MOTORS, PULLEYS, AND BELTS — Access to these components is through the door below the side economizer hoods on both sides of the unit. See Fig. 113 and 114.

RETURN AIR FILTERS — Access to these filters is through the door marked FILTER SECTION on the right side of the unit.

UNIT CONTROL BOX — Access to this component is through the doors marked ELECTRICAL SECTION on the condenser end of the unit (when facing the condenser coil).

GAS HEAT SECTION — Access to the gas heat section is through the door labeled HEAT SECTION on the right side of the unit (when facing return air end). See Fig. 115 and 116.

All gas system components are in the gas section.

MAIN BURNERS — At the beginning of each heating season, inspect for deterioration due to corrosion or other causes. Observe the main burner flames and adjust if necessary. See Gas System Adjustment section on page 111.

FLUE GAS PASSAGEWAYS — The flue collector box and heat exchanger cells may be inspected by removing heat exchanger access panel (Fig. 15-23), flue box cover, and main burner assembly (Fig. 117). Refer to Main Burners section on page 111 for burner removal sequence. If cleaning is required, remove heat exchanger baffles and clean tubes with a wire brush.

Use caution with ceramic heat exchanger baffles. When installing retaining clip, be sure the center leg of the clip extends inward toward baffle. See Fig. 118.

COMBUSTION-AIR BLOWERS — Clean periodically to assure proper airflow and heating efficiency. Inspect blower wheel every fall and periodically during heating season. For the first heating season, inspect blower wheel bi-monthly to determine proper cleaning frequency.

To inspect blower wheel, remove heat exchanger access panel. Shine a flashlight into opening to inspect wheel. If cleaning is required, remove motor and wheel assembly by removing screws holding motor mounting plate to top of combustion fan housing (Fig. 119). The motor and wheel assembly will slide up and out of the fan housing. Remove the blower wheel from the motor shaft and clean with a detergent or solvent. Replace motor and wheel assembly.

ECONOMIZER DAMPER MOTOR — On units so equipped, the economizer motor is located in the mixing box section. Access to it is through the door labeled FILTER SECTION on the right-hand side of the unit.

CONDENSER FANS AND FAN MOTORS — Remove the wire fan guard on top of the unit to gain access to the condenser fans and motors.

INLET GUIDE VANE MOTOR — The inlet guide vane motor is located on the evaporator-fan sled on the side opposite the fan motor. See Fig. 120A and 120B. Access is through the door labeled FAN SECTION on the left side of the unit.

25% OUTDOOR-AIR DAMPER — Access to adjust the damper is through the hoods. Remove filters to gain access into unit to adjust linkage arms.

MODULATING POWER EXHAUST DAMPER MOTOR — The modulating power exhaust damper motor is located in the return-air end of the unit.

On unit sizes 030-050, it is accessed by removing the access panel on the left-hand corner post. See Fig. 113.

IMPORTANT: When replacing panel, be sure to properly secure it in order to prevent water from being drawn into the unit.

On unit sizes 055-105, the motor is accessed through the small door below the side economizer hoods on the left side of the unit. See Fig. 114.

RETURN-AIR FILTERS — Access to these filters is through the door marked FILTER SECTION. Filters in upper and lower bag filter tracks can only be removed from the right side of the unit.

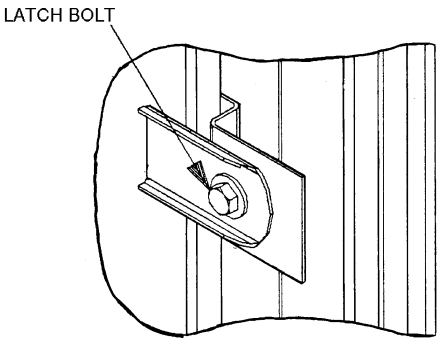


Fig. 111 — Door Latch

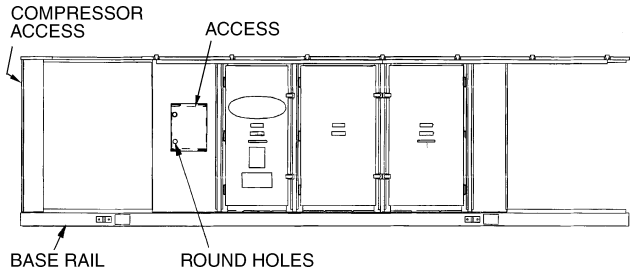


Fig. 112 — Typical Filter Drier and Liquid Service Valve Access

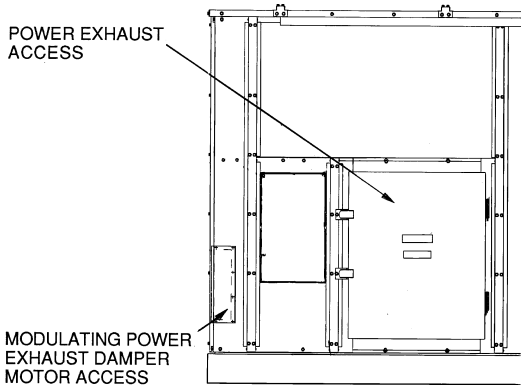


Fig. 113 — Modulating Power Exhaust Damper Motor Access, Size 030-050 Units

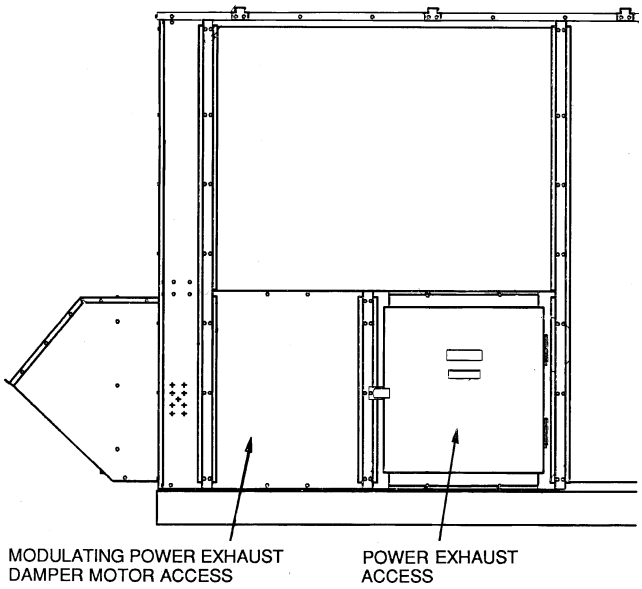
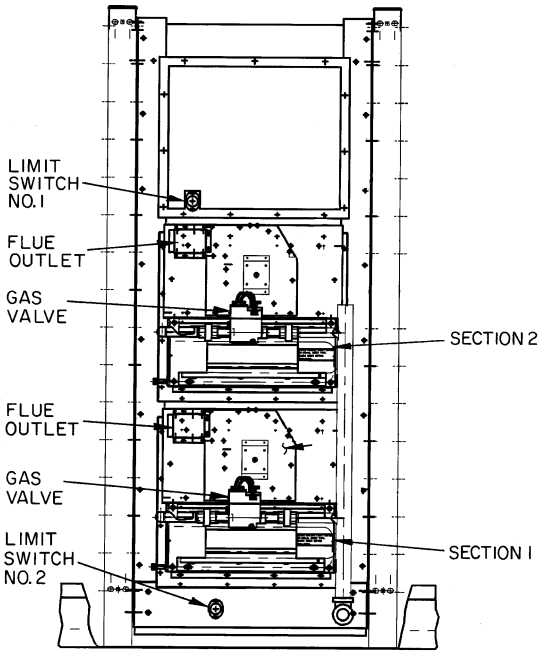
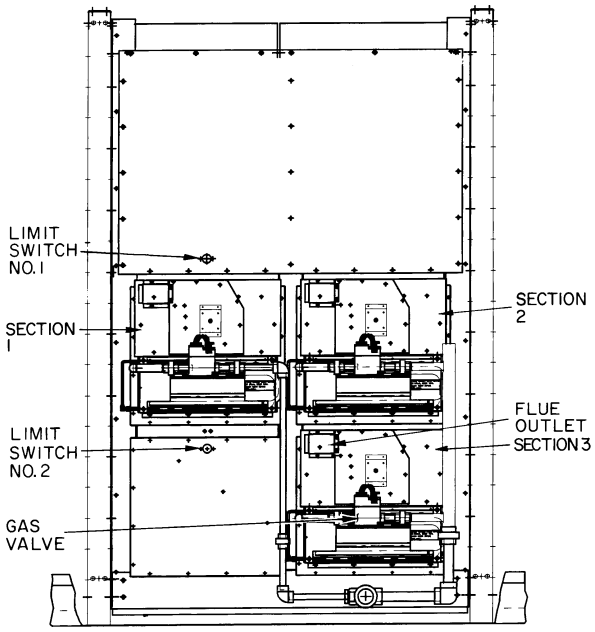


Fig. 114 — Modulating Power Exhaust Motor Access, Size 055-105 Units



NOTE: High heat consists of sections 1 and 2. Low heat consists of section 1 only.

Fig. 115 — Gas Section Detail, Sizes 030-050



NOTE: High heat consists of sections 1-3. Low heat consists of sections 1 and 2 only.

Fig. 116 — Gas Section Detail, Sizes 055-105

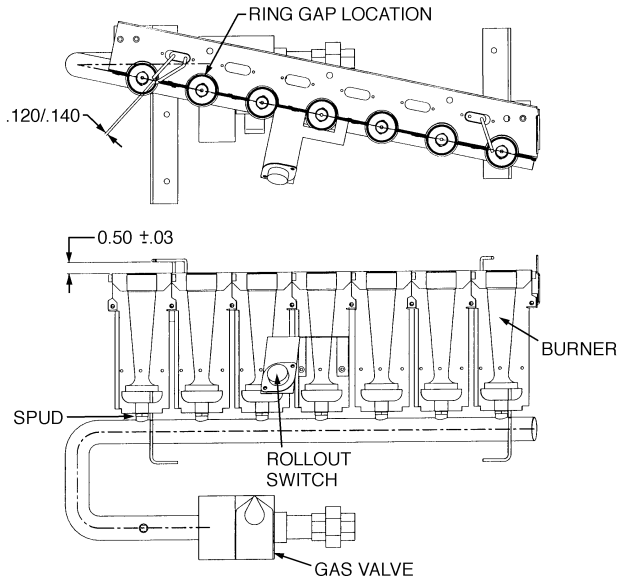
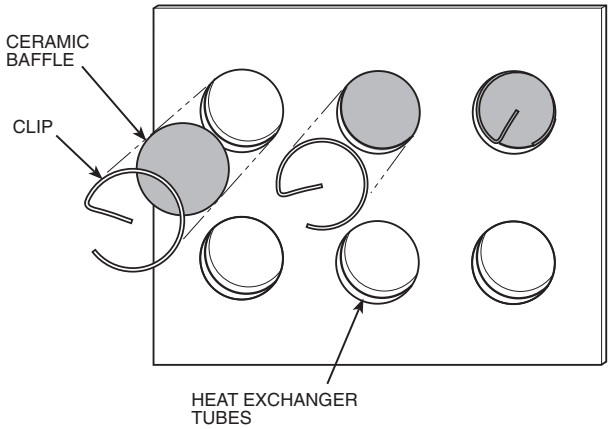


Fig. 117 — Burner Section Detail



NOTE: One baffle and clip will be in each upper tube of the heat exchanger.

Fig. 118 — Removing Heat Exchanger Ceramic Baffles and Clips (P/N 48TJ500399)

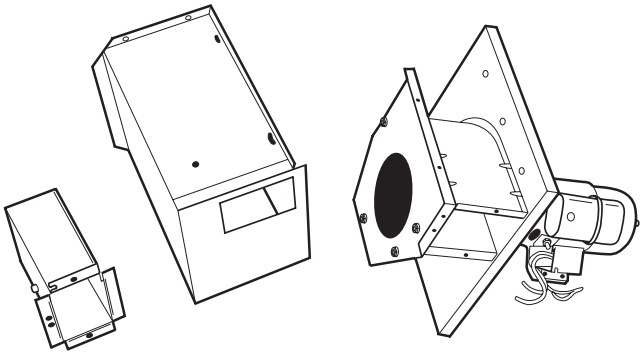


Fig. 119 — Combustion Blower Removal

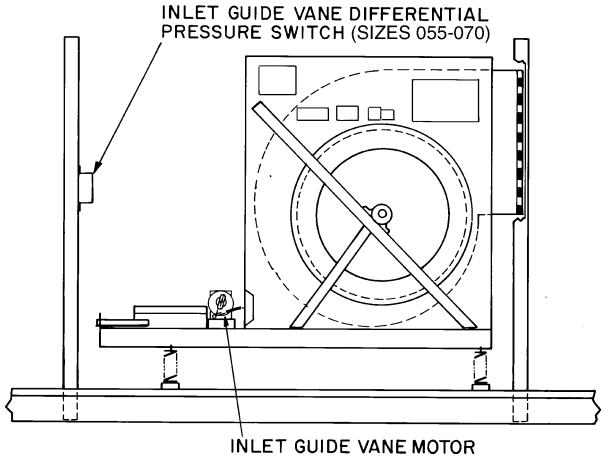


Fig. 120A — Inlet Guide Vane Motor (Sizes 055-070)

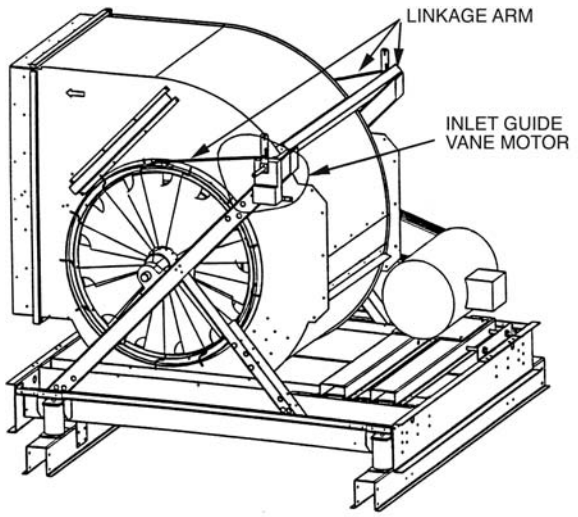


Fig. 120B — Inlet Guide Vane Motor (Sizes 075-105)

Adjustments

RETURN/EXHAUST FAN MOTOR PLATE

Adjust using a $^{3}/_{4}$-in. wrench on the adjusting bolts:

1. Loosen holddown bolts. (See Fig. 121).
2. Turn the adjusting bolts to move the motor mounting plate toward or away from the fan to loosen or tighten the belts. Make the same number of turns to each bolt.
3. Retighten holddown bolts.

SUPPLY FAN AND POWER EXHAUST MOTOR PLATE — Adjust using a $^{15}/_{16}$-in. wrench on the adjusting bolts:

1. Loosen holddown bolts. (See Fig. 122.)
2. Turn the adjusting bolts to move the motor mounting plate toward or away from the fan to loosen or tighten the belts. Make the same number of turns to each bolt.
3. Retighten holddown bolts.

RETURN/EXHAUST BUILDING PRESSURE SWITCH (48ZC,ZR075-105 Units Only) — The building pressure switch (BPS) is mounted below the auxiliary control box next to the access door labeled FILTER SECTION. See Fig. 123.

The return/exhaust BPS has a set point range limit of –0.25 in. wg to 0.25 in. wg. The building pressure can be set up at any range not exceeding the upper and lower limits of the BPS. Factory setting is 0 in. wg lower limit and 0.1 in. wg upper limit. To adjust lower limit (left) set point, use the left adjusting knob located at the bottom of the front cover to point the left set point pointer to desired pressure reading. To adjust upper limit (right) set point, use the right adjusting knob located at the bottom of the front cover. The smaller the lower/upper range is, the closer the pressure will be maintained to desired set point range. See Fig. 124.

To set the pressure indicating pointer to zero, use the zero adjust screw located at the bottom of the front cover. Note than this adjustment can only be made with the high and low pressure taps both open to atmosphere.

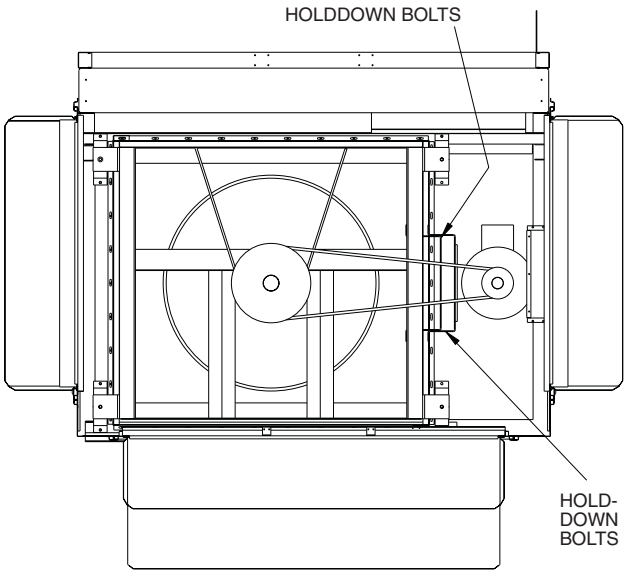


Fig. 121 — Return/Exhaust Fan Motor Plate Adjustment

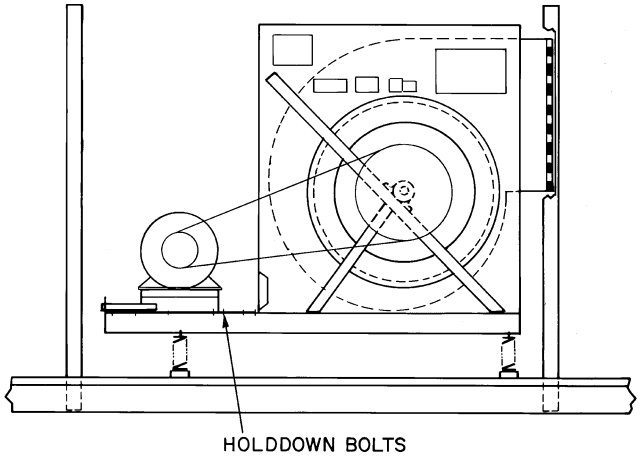


Fig. 122 — Motor Plate Adjustment

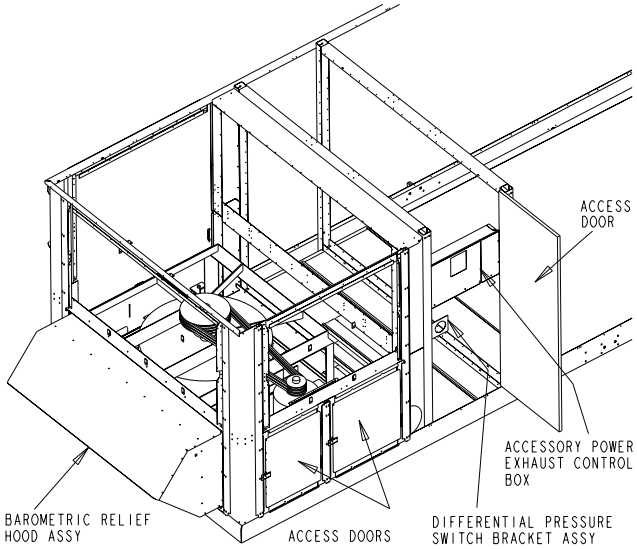


Fig. 123 — Return/Exhaust Fan Detail; 48ZC,ZL,ZR Units

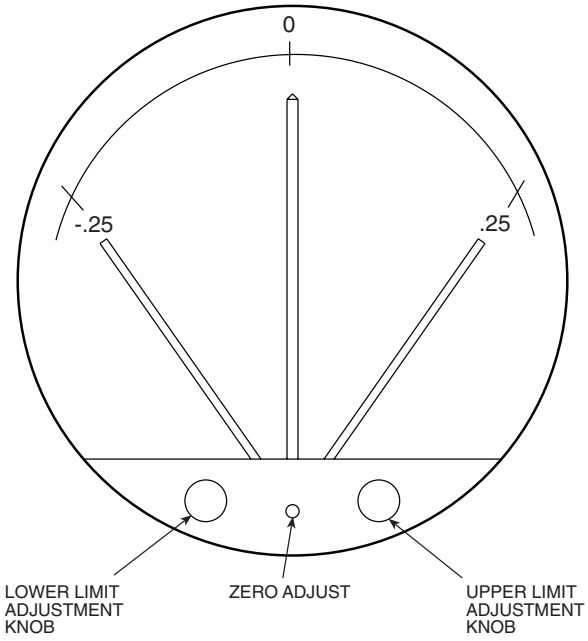


Fig. 124 — Return/Exhaust Building Pressure Switch

MODULATING POWER EXHAUST DIFFERENTIAL PRESSURE SWITCH — On size 030-050 units, the differential pressure switch is located in the auxiliary control box. The auxiliary control box is mounted in the corner next to the power exhaust motor door. To gain access to the auxiliary control box, remove the auxiliary control box cover. When replacing the auxiliary control box cover, be sure to secure the cover properly in order to prevent water from being drawn into the auxiliary control box. See Fig. 125.

On size 055-105 units, the differential pressure switch is mounted below the auxiliary control box next to the access door labeled FILTER SECTION. See Fig. 126.

The modulating power exhaust DPS has a set point range of 0.5 in. wg to –0.5 in. wg. Factory setting is +0.1 in. wg. To adjust set point, turn set point adjusting screw (see Fig. 127) clockwise to decrease set point and counterclockwise to increase set point. This switch also has an adjustable null span. The null span is the pressure change that can be made without contacts opening or closing. It is adjustable from 0.06 in. wg to 0.14 in. wg when set point is at minimum position (–0.5 in. wg) and 0.07 in. wg to 0.14 in. wg when set point is at maximum position (+0.5 in. wg). To adjust null span, turn null adjusting screw (Fig. 127) clockwise to decrease span and counterclockwise to increase span. All switches leave factory with null span set at maximum position. The smaller the null span, the closer the pressure will be maintained to desired set point.

INLET GUIDE VANE DIFFERENTIAL PRESSURE SWITCH (Units With Optional Inlet Guide Vanes and Static Pressure Control) — On size 030-050 units, the inlet guide vane differential pressure switch is located in the auxiliary control box. The auxiliary control box is mounted in the corner of the unit under the side air hood that is next to the access door marked FILTER SECTION. To gain access to the auxiliary box, remove the auxiliary control box cover. When replacing the auxiliary control box cover, be sure to secure the cover properly in order to prevent water from being drawn into the auxiliary control box.

On size 055-105 units, the inlet guide vane differential pressure switch is mounted on an upright located behind the evaporator-fan motor. See Fig. 120.

POWER EXHAUST INTERLOCK — Refer to the Controls and Troubleshooting manual for 48ZE,ZJ,ZL,ZR,ZV,ZW units for instructions on adjusting the IGV differential pressure switch.

SWITCH ADJUSTMENT — Units with an optional economizer have an auxiliary switch located on the economizer damper motor. If other than the factory setting is desired, follow the steps below.

⚠ CAUTION

Do not turn motor shaft by hand or with a wrench. Damage to the gear train will result.

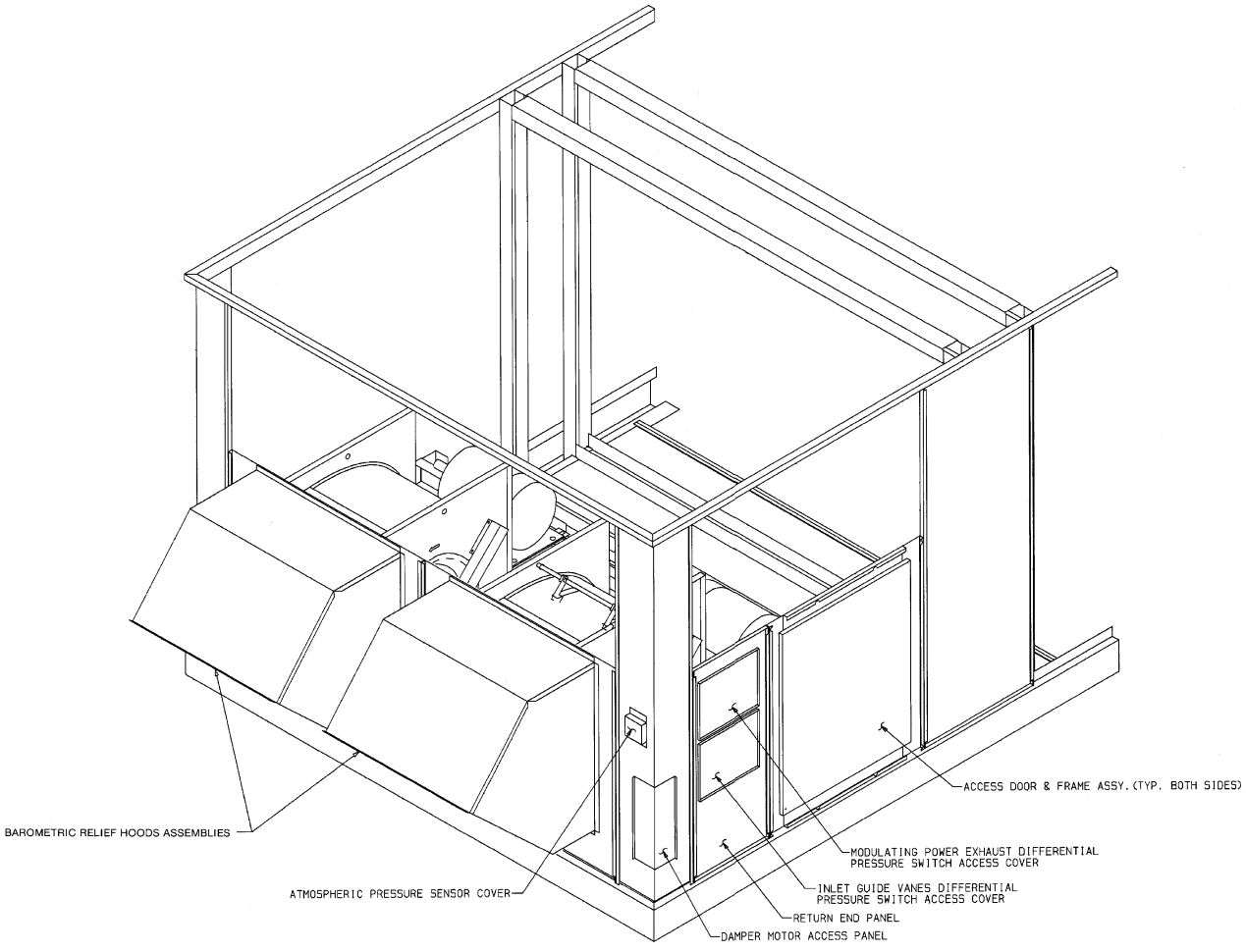

ACCESS DOOR & FRAME ASSY. (TYP. BOTH SIDES)
BAROMETRIC RELIEF HOODS ASSEMBLIES
MODULATING POWER EXHAUST DIFFERENTIAL PRESSURE SWITCH ACCESS COVER
INLET GUIDE VANES DIFFERENTIAL PRESSURE SWITCH ACCESS COVER
ATMOSPHERIC PRESSURE SENSOR COVER
RETURN END PANEL
DAMPER MOTOR ACCESS PANEL

Fig. 125 — Power Exhaust Detail; Sizes 030-050

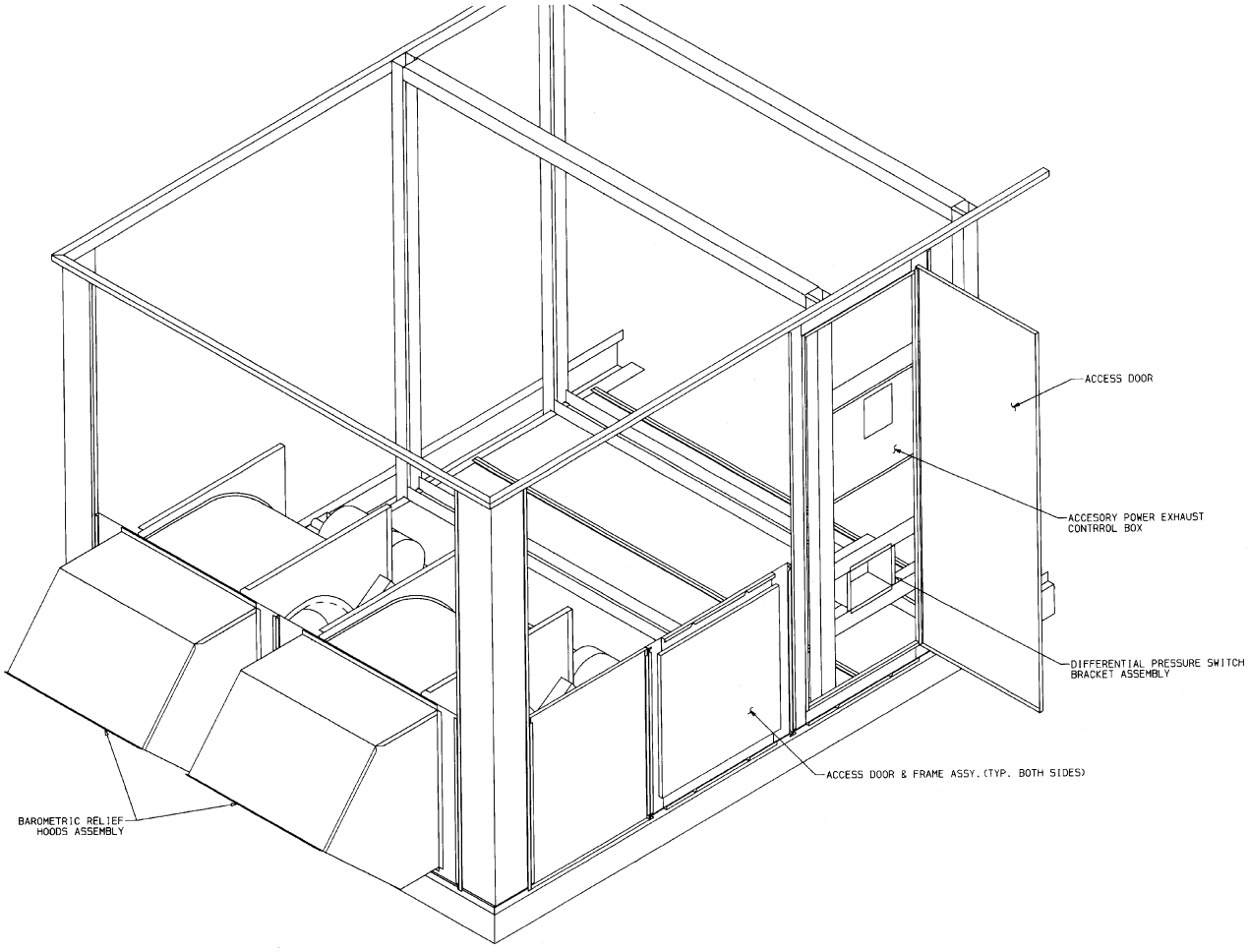
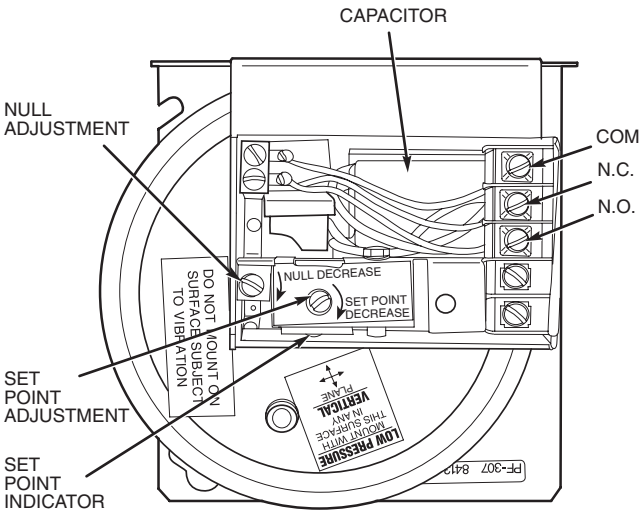

ACCESS DOOR
ACCESORY POWER EXHAUST CONTRROL BOX
DIFFERENTIAL PRESSURE SWITCH BRACKET ASSEMBLY
ACCESS DOOR & FRAME ASSY. (TYP. BOTH SIDES)
BAROMETRIC RELIEF HOODS ASSEMBLY

Fig. 126 — Power Exhaust Detail; Sizes 055-105



LEGEND

COM — Common
N.C. — Normally Closed
N.O. — Normally Open

Fig. 127 — Differential Pressure Switch for Modulating Power Exhaust Option

1. Remove top cover from motor to gain access to motor terminals and cam adjustments.
2. Disconnect controller from motor. Connect RED, WHITE, and BLUE terminals on the 135-ohm manual potentiometer to corresponding RED, WHITE, and BLUE terminals on the motor. Connect 24-vac power to Terminals 1 and 2. See Fig. 128.
3. Adjust the 135-ohm potentiometer so that the motor shaft turns to the position where auxiliary equipment is to be switched.
4. Adjust auxiliary cam by inserting a $^1/_8$-in. straight blade screwdriver into slot on cam and moving TOP of screwdriver to the right or left. See Fig. 129.
5. To close auxiliary switch RED and BLUE contacts as the motor travels open (energizing the power exhaust motor), the switch differential can only be 10 degrees on both switches. To adjust either cam, perform the following steps:
   a. If RED and BLUE contacts are open, rotate the cam counterclockwise until the contacts close.
   b. If the RED and BLUE contacts are closed, rotate the cam clockwise until the contacts open.
6. The auxiliary switch is set as follows:

UNIT	SWITCH	CONTROLS	ECON OPEN (Switch Closes)
CONSTANT VOLUME UNITS	Switch 1	1st Stage PE or MPE	35%
	Switch 2	2nd Stage PE	75%

LEGEND

ECON — Economizer
MPE — Modulating Power Exhaust
PE — Power Exhaust

BELT INSTALLATION AND TENSIONING

IMPORTANT: When installing or replacing belts, always use a complete set of new, matched belts to prevent potential vibration problems. Mixing belts often results in premature breakage of the new belts.

1. Turn off unit power.
2. Adjust motor plate so belts can be installed without stretching over the grooves of the pulley. (Forcing the belts can result in uneven belt stretching and a mismatched set of belts.)
3. Before tensioning the belts, equalize belt slack so that it is on the same side of the belt for all belts. Failure to do so may result in uneven belt stretching.
4. Tighten belts using the motor plate adjusting bolts.
5. Adjust until proper belt tension ($^1/_2$-in. [13 mm] deflection with one finger) is obtained. Be sure to adjust both adjusting bolts the same number of turns.

   NOTE: Check the tension at least twice during the first day of operation, as there is normally a rapid decrease in tension until the belts have run in. Check tension periodically thereafter and keep it at the recommended tension.

With the correct belt tension, belts may slip and squeal momentarily on start-up. This slippage is normal and disappears after wheel reaches operating speed. Excessive belt tension shortens belt life and may cause bearing and shaft damage.

PULLEY ALIGNMENT — For proper belt life, the motor and fan pulleys must be properly aligned. To check, first turn off unit power. Place a straightedge against the motor and fan pulleys. See Fig. 130. If the pulleys are properly aligned, the straightedge should be parallel to the belts.

If they are not parallel, check that the motor shaft and fan shaft are parallel. If they are not, adjust the motor plate adjusting bolts until they are.

After verifying that the shafts are parallel, loosen the setscrews on the motor pulley. Move pulley on the shaft until the pulleys are parallel. To move the sheave on the shaft, loosen the belts. If necessary, blower sheave can also be moved on the shaft.

INSTALLING REPLACEMENT MOTOR PULLEY (Supply Fan Only) — To install a field-supplied replacement pulley:

1. Turn off unit power.
2. Loosen belts using motor adjusting bolts until belts can be removed without stretching them over the grooves of the pulley.
3. Remove belts.
4. Loosen setscrews on motor pulley.
5. Slide pulley off motor shaft. Make sure setscrews on new pulley are loose.
6. Slide new pulley onto fan shaft and align it with the fan pulley as described in Pulley Alignment section above.
7. Tighten setscrews.
8. Install belts and tension properly as described in Pulley Alignment section above.

CONDENSER FAN ADJUSTMENT (Units Without High Capacity Evaporator Coil)

1. Turn off unit power.
2. Remove fan guard and loosen fan hub setscrew.
3. See Fig. 131 and adjust fan height using a straight edge laid across the fan deck.
4. Tighten setscrew and replace rubber hubcap to prevent hub from rusting to the motor shaft. Fill hub recess with Permagum if hub has no rubber hubcap.
5. Replace fan guard.

CONDENSER FAN ADJUSTMENT (Sizes 050,070,075 With High Capacity Evaporator Coil Option) — Each fan is supported by a formed wire mount bolted to a fan deck and covered with a wire guard. The exposed end of the fan motor shaft is protected from weather by grease. If the fan motor must be removed for service or replacement, be sure to regrease fan shaft and reinstall fan cover, retaining clips, and fan guard. For proper performance, the fans should be positioned as shown in Fig. 132. Tighten setscrews to 14 ± 1 ft-lb (18 ± 1.3 N-m).

Check for proper rotation of the fan(s) once reinstalled (counterclockwise viewed from above). If necessary to reverse, switch leads at contactor(s) in control box.

Cleaning — Inspect unit at the beginning of each heating and cooling season and during each season as operating conditions may require.

Clean condenser coil with a vacuum cleaner, fresh water, compressed air, or a bristle brush (not wire). Coil cleaning should be a part of the planned maintenance program. Clean evaporator coil with a stiff bristle brush (not wire), vacuum cleaner, or compressed air.

Check and clean condensate drain annually at the start of the cooling season.

Replace return-air filters at the start of each heating and cooling season or as often as necessary during each season, depending on operating conditions. See Tables 1A-1C for filter types, quantities, and sizes.

1. Remove economizer outdoor-air filters from the hoods by removing the filter retainers.
2. Clean filters with steam or hot water and mild detergent.
3. Reinstall filters in hoods after cleaning. Never replace cleanable filters with throwaway filters.

Lubrication

COMPRESSORS — Each compressor is correctly charged at the factory. Refer to 06D and 06E Compressor Service Manuals if additional information regarding compressor lubrication system is required. See Compressor Oil section on page 83.

FAN SHAFT BEARINGS — Lubricate fan shaft bearings at least once a year with suitable bearing grease. Extended grease lines are provided on pulley side of blower. Typical lubricants are given below:

MANUFACTURER	LUBRICANT
Texaco	Regal AFB-2*
Mobil	Mobilplex EP No. 1
Sunoco	Prestige 42
Texaco	Multifak 2

*Preferred lubricant because it contains rust and oxidation inhibitors.

INLET GUIDE VANE BEARINGS (Units With Optional Inlet Guide Vanes) — These bearings are oil impregnated. Lubricate annually with a few drops of nondetergent SAE (Society of Automotive Engineers) 20 oil.

FAN MOTOR BEARINGS — The condenser- and evaporator-fan motors have sealed bearings so no field lubrication is required.

DOOR HINGES — All door hinges should be lubricated at least once a year.

Refrigerant Feed Components — Each refrigerant circuit (2 per unit) has all the necessary refrigerant controls.

Thermostatic Expansion Valve (TXV) — On sizes 030 and 035, each circuit has one. On size 040 and 050, each circuit has 2. The superheat is nonadjustable. On sizes 055-105, each circuit has 2 TXVs on which superheat may be adjusted if absolutely necessary.

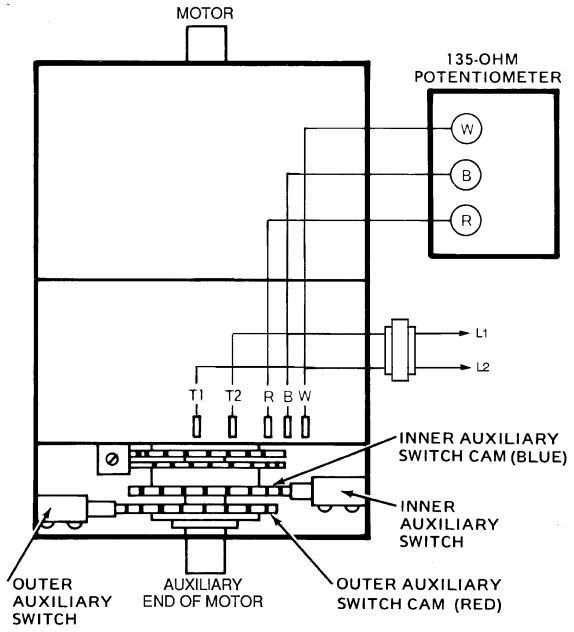


Fig. 128 — Auxiliary Switch Stroke Adjustment

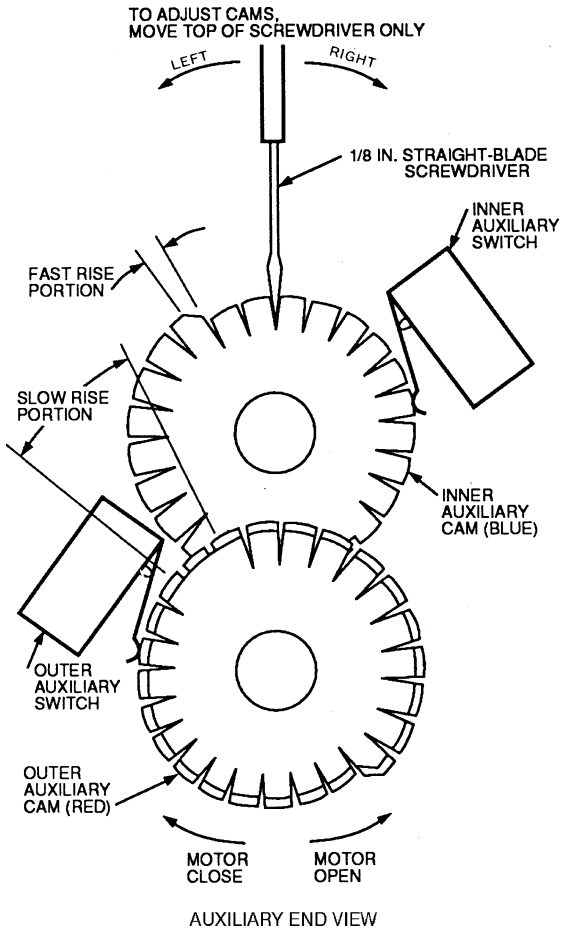


Fig. 129 — Auxiliary Switch Adjustment

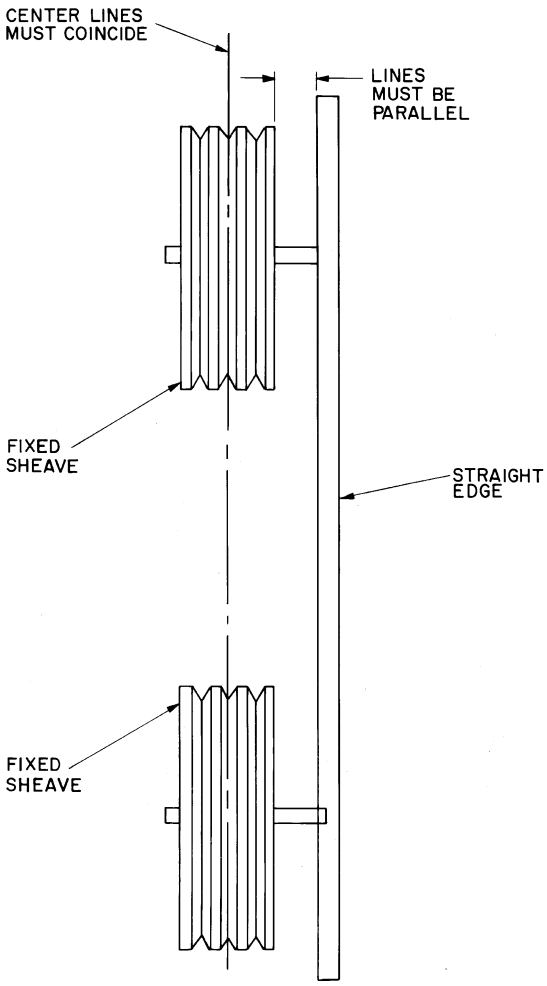


Fig. 130 — Pulley Alignment

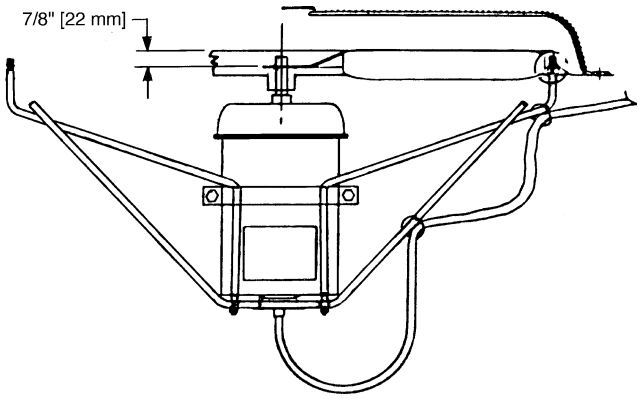


Fig. 131 — Condenser-Fan Adjustment (Standard Units)

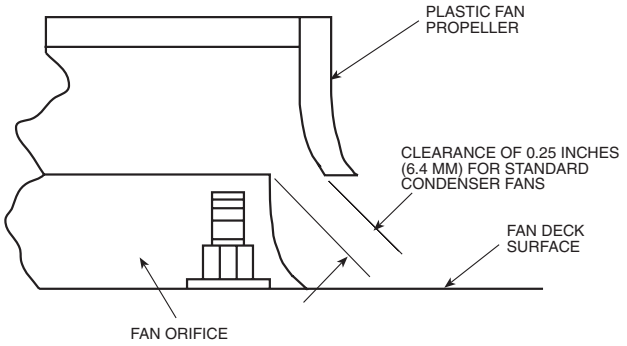


Fig. 132 — Condenser Fan Position (Units with High Capacity Evaporator Coil Option)

The TXV is set to maintain 10 to 13 F superheat leaving the evaporator coil. It controls the flow of refrigerant to the evaporator coils.

Refrigeration Circuits

LEAK TESTING — Units are shipped with a full operating charge of R-22 (see Tables 1A-1C). If there is no pressure in the system, introduce enough nitrogen to search for the leak. Repair the leak using good refrigeration practices. After leaks are repaired, system must be evacuated and dehydrated using methods described in GTAC II, Module 4, System Dehydration.

REFRIGERANT CHARGE (Refer to Tables 1A-1C) — At the liquid line connection point on each circuit is a factory-installed liquid line service valve. On each valve is a 1/4-in. Schrader connection for charging liquid refrigerant.

All units are shipped with a complete operating charge of R-22. See unit nameplate and Tables 1A-1C for amount of charge. When adding a complete charge, evacuate system using standard evacuating procedures and weigh in the specified amount of charge. All units use the same charging chart. See Fig. 133.

Charging with Unit Off and Evacuated — Close liquid line service valve before charging. Weigh in charge shown in Tables 1A-1C. Open liquid line service valve; start unit and allow it to run several minutes fully loaded. Check for a clear sight glass. Be sure clear condition is liquid and not vapor. Complete charging the unit.

Charging with Unit Running — If charge is to be added while unit is operating, it is necessary to have all condenser fans and compressors operating. It may be necessary to block condenser coils at low-ambient temperatures to raise condensing pressure to approximately 280 psig to turn all condenser fans on. Do not totally block a coil to do this. Partially block all coils in uniform pattern. Charge vapor into compressor low-side service port located above oil pump crankshaft housing. Charge each circuit until sight glass shows clear liquid.

Oil Charge — All units are factory charged with oil. Acceptable oil level for each compressor is shown in Fig. 102, page 83 and Table 52).

When additional oil or a complete charge is required, use only Carrier-approved compressor oil.

Approved oils are:
Petroleum Specialties, Inc. — Cryol 150A (factory oil charge)
Texaco, Inc. — Capella WF-32-150
Witco Chemical Co. — Suniso 3GS

Do not reuse drained oil, and do not use any oil that has been exposed to atmosphere.

ADD OIL — Close suction shutoff valve and pump down crankcase to 2 psig. (Low-pressure cutout must be jumpered.) Wait a few minutes and repeat until pressure remains steady at 2 psig. Remove oil fill plug above the oil level sight glass, add oil through plug hole, and replace plug. Run compressor for 20 minutes and check oil level.

REMOVE OIL — Pump down compressor to 2 psig. Loosen the 1/4-in. pipe plug at the compressor base and allow the oil to seep out past the threads of the plug.

NOTE: The crankcase will be slightly pressurized. Do not remove the plug, or the entire oil charge will be lost.

Small amounts of oil can be removed through the oil pump discharge connection while the compressor is running.

Table 52 — Oil Charge

COMPRESSOR	OIL CHARGE (Pints)
06D	10.0
06E 299	19.0
All other 06E	20.0

Gas System Adjustment

GAS VALVE ADJUSTMENT — The gas valve opens and closes in response to the PIC control or limit control.

When power is supplied to valve terminals D1 and C2, the main valve opens to its preset position.

The regular factory setting is stamped on the valve body (3.3 in. wg).

To adjust regulator:

1. Set thermostat at setting for no call for heat.
2. Turn main gas valve to OFF position.
3. Remove 1/8-in. pipe plug from manifold or gas valve pressure tap connection. Install a suitable pressure-measuring device.
4. Set main gas valve to ON position.
5. Set thermostat at setting to call for heat.
6. Remove screw cap covering regulator adjustment screw (see Fig. 134).
7. Turn adjustment screw clockwise to increase pressure or counterclockwise to decrease pressure.
8. Once desired pressure is established, set thermostat setting for no call for heat, turn off main gas valve, remove pressure-measuring device, and replace 1/8-in. pipe plug and screw cap.

MAIN BURNERS — For all applications, main burners are factory set and should require no adjustment.

MAIN BURNER REMOVAL AND REPLACEMENT

1. Shut off (field-supplied) manual main gas valve.
2. Shut off power to unit.
3. Remove gas section access door, door frame, and corner post.
4. Disconnect gas piping from gas valve inlet.
5. Remove wires from gas valve.
6. Remove wires from rollout switch.
7. Remove sensor wire and ignitor cable form IGC board.
8. Remove 2 screws securing manifold bracket to basepan.
9. Remove 2 screws that hold the burner support plate flange to the vestibule plate.
10. Lift burner assembly out of unit.
11. Replace burner assembly. Reinstall by reversing steps 1 to 10.

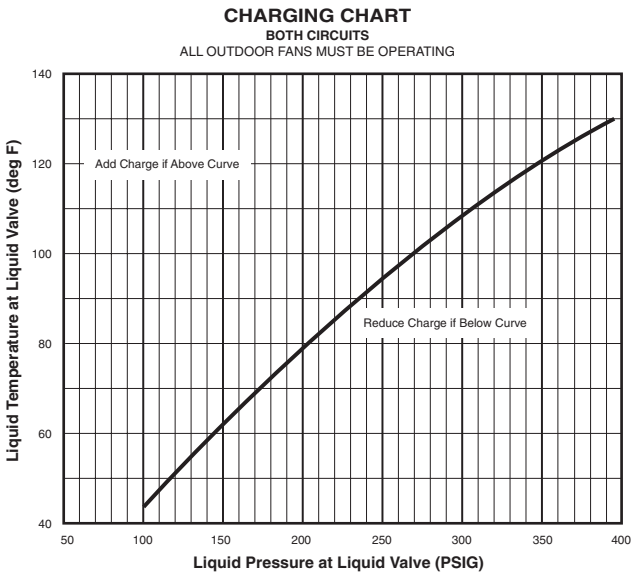


Fig. 133 — Charging Chart — 48Z030-105 Units

Moisture/Liquid Indicator — A clear flow of liquid refrigerant indicates sufficient charge in the system. Bubbles indicate undercharged system or the presence of noncondensables. Moisture in the system measured in parts per million (ppm) changes the color of the indicator:

Green — moisture below 45 ppm (dry)
Chartreuse — 45 to 130 ppm (caution!)
Yellow — moisture above 130 ppm (wet)

Change filter driers at the first sign of moisture in the system. See Carrier Charging Handbook for more information.

IMPORTANT: Unit must be in operation at least 12 hours before moisture indicator can give an accurate reading. With unit running, indicating element must be in contact with liquid refrigerant to give a true reading.

Filter Drier — Replace whenever the moisture/liquid indicator shows moisture in the system.

Liquid Line Service Valve — Located immediately ahead of the filter drier, this valve has a $^1/_4$-in. flare connection for field charging. With the liquid circuit shut, the compressor can be used to pump the refrigerant down into the high side. The refrigerant can then be stored there by closing the compressor discharge valve.

Compressor Discharge Service Valve — Each compressor has one.

Compressor Suction Service Valve — Each compressor has one.

Protective Devices

COMPRESSOR PROTECTION

Overcurrent — Each compressor has one manual reset, calibrated trip, magnetic circuit breaker. Do not bypass connections or increase the size of the circuit breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

Overtemperature — Each 06D compressor has an internal protector to protect it against excessively high discharge gas temperatures. Each 06E compressor has an external discharge gas thermostat. See Fig. 135. They will reset, but the circuit will automatically be locked out by the control board. Unit must be manually reset by interrupting control power.

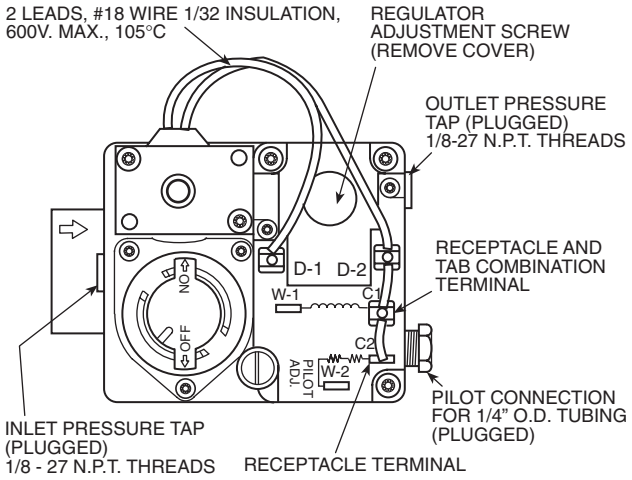


Fig. 134 — Gas Valve

Crankcase Heater — Each compressor has a crankcase heater to prevent absorption of liquid refrigerant by oil in the crankcase when the compressor is idle. Since 115-v power for the crankcase heaters is drawn from the unit control circuit, main unit power must be on for the heaters to be energized.

IMPORTANT: After a prolonged shutdown or service job, energize the crankcase heaters for 24 hours before starting the compressor.

Compressor Lockout — If any of the safeties (compressor internal thermostat [06D compressors only], high-pressure, or low-pressure) trip, or if there is a loss of power to the compressors, the compressors will be locked out. To reset 48ZA,ZC,ZT units, manually move the thermostat setting. To reset 48ZE,ZJ,ZL,ZR,ZV,ZW units, consult the controls and troubleshooting literature for the appropriate unit for details.

EVAPORATOR-FAN MOTOR PROTECTION — A manual reset, calibrated trip, magnetic circuit breaker protects against overcurrent. Do not bypass connections or increase the size of the breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

CONDENSER-FAN MOTOR PROTECTION — Each condenser-fan motor is internally protected against overtemperature. They are also protected against a severe overcurrent condition by manual reset, calibrated trip, magnetic circuit breakers on a common circuit. As with the circuit breakers, do not bypass connections or increase breaker size to correct trouble. Determine the cause and correct it before resetting the breaker.

HIGH- AND LOW-PRESSURE SWITCHES — See Fig. 135 for compressor mounting locations. Settings for these switches are shown in Tables 53A and 53B. If either switch trips, that refrigerant circuit will be automatically locked out by the controls. To reset, recycle control power to unit.

Table 53A — Pressure Switch Settings (psig)

SWITCH	CUTOUT	CUT-IN
High	426 ± 7	320 ± 20
Low	27 ± 4	67 ± 7

Table 53B — Pressure Switch Settings (Pa)

SWITCH	CUTOUT	CUT-IN
High	2937 ± 48	2206 ± 138
Low	186 ± 28	462 ± 48

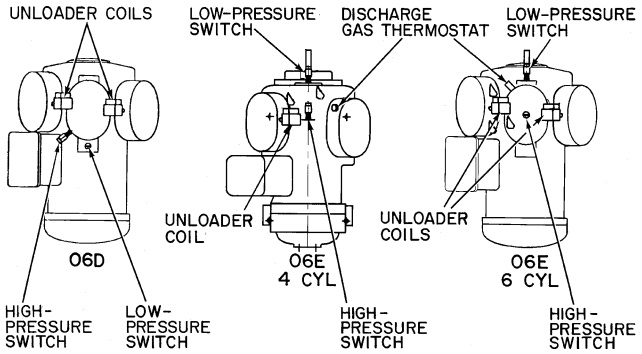


Fig. 135 — Typical Compressor Overtemperature, High- and Low-Pressure Switch Locations

Relief Devices — All units have relief devices to protect against damage from excessive pressures (i.e., fire). These devices protect the high and low side.

Control Circuit, 115 V — This control circuit is protected against overcurrent by a 5-amp circuit breaker. Breaker can be reset. If it trips, determine cause of trouble before resetting.

Control Circuit, 24 V — This control circuit is protected against overcurrent by a 3.2-amp circuit breaker. Breaker can be reset. If it trips, determine cause of trouble before resetting.

Gas Heat

LIMIT SWITCHES — The maximum supply-air temperature is controlled by a limit switch located in the gas section. The limit is designed to trip at 100 F above the maximum temperature rise shown in Tables 1A-1C.

When the limit trips, 2 flashes occur on the IGC board. The gas valve is deenergized. After cooling, the system will reset and fires gas again. If four trips occur, the system shuts down into Lockout and 4 flashes occur on the IGC board. The system must then be manually reset by power down and power up of the unit.

LIMIT SWITCH THERMISTOR (Staged Gas Unit Only) — The limit switch thermistor is a factory-installed component. It is located next to the lower limit switch. The limit switch thermistor senses temperature at limit switch location and prevents the limit from tripping while the unit is operating at low airflow. See Table 19.

ROLLOUT SWITCH — This switch senses any flame or excessive heat in the main burner compartment and deenergizes the gas valve. If this occurs, the gas heating system is locked out (7 flashes on IGC board) until the rollout switch is reset manually. Reset rollout switch manually by powering down and powering up of the unit.

When the rollout switch trips, it usually indicates a flue blockage. Inspect the unit for any obstruction in the flue system, for holes in the flue box, a defective hall effect sensor, a defective inducer motor, or a loose combustion blower.

Compressor Removal — Access to the pump end of the compressor is from the compressor side of the unit. Access to the motor end of the compressor is from the inside of the unit. All compressors can be removed from the compressor side of the unit.

IMPORTANT: All compressor mounting hardware and support brackets removed during servicing must be reinstalled prior to start-up.

1. Disconnect power to unit; lockout power to compressor.
2. Close suction and discharge service valves.
3. Relieve refrigerant pressure into a refrigerant recovery system.
4. Remove:
   a. Fan-cycling pressure switch (FCPS)
   b. High-pressure switch
   c. Low-pressure switch
5. Disconnect power wires at terminal box and disconnect conduit.
6. Disconnect wires from crankcase heater.
7. Disconnect service valves from compressor.
8. Remove 4 locknuts securing compressor to the spring assemblies.
9. Lift compressor off mounting bolts and remove.

Compressor Replacement — Perform the following:

1. Reverse procedure in Compressor Removal section to end of Step 4.
2. Reinstall service valves and safety switches, and tighten to torques as listed:

TORQUE	COMPRESSOR(S)
Tighten discharge valves to —	
20-25 ft-lbs (27- 34 N-m) **80-90 ft-lbs (109-122 N-m)**	06E-250, 06D-537 06E-265,275,299
Tighten suction valves to —	
80- 90 ft-lbs (109-122 N-m) **90-120 ft-lbs (122-163 N-m)**	06E-250, 06D-537 06E-265,275,299
Tighten the following fittings as specified —	
120 in.-lbs (13.5 N-m) **120 in.-lbs (13.5 N-m)**	High-Pressure Switch Low-Pressure Switch

3. Leak-check and evacuate system, reclaim refrigerant.
4. Recharge system per pre-start-up and start-up sequences. Recheck oil levels.
5. Energize crankcase heater for 24 hours prior to restart of system.

TROUBLESHOOTING

The following Troubleshooting section applies to CV units (48ZA,ZT) only. For expanded controls and troubleshooting on other units (VAV and PIC) and return/exhaust fan, refer to the Controls and Troubleshooting literature provided in the installation packet with the unit.

Economizer — The economizer control consists of an electronic control board mounted on the back of the cover plate of the economizer motor with the adjustments and electrical plugs accessible through the top of the cover. The economizer control is factory wired to the terminals on the motor. All potentiometers and adjustments are a part of the control board.

ECONOMIZER MOTOR CHECKOUT — The motor may be checked out separately from the control board. See Table 54 for motor checkout. To check out the motor, apply 24 VAC power to terminals T0 and T2 of the control board.

NOTE: The connections to motor terminals T1 and R must remain in place.

Table 54 — Economizer Motor Checkout

MOTOR TEST	PROCEDURE	EXPECTED RESULT AND RESPONSE
A	Remove wire connected to terminal W on the motor.	Motor drives open. If not, replace the motor.
B	Remove wire connected to terminal B on the motor, leaving W wire disconnected (Test A).	Motor drives closed. If not, replace the motor.

CONTROL BOARD CHECKOUT — To check out the control board motor, conduct the following 4 tests.

Test 1:

1. Apply 24 VAC power to terminals T0 and T2 of control board.
2. Remove mixed air sensor connected between terminals S1 and S2.
3. Remove outdoor-air enthalpy sensor between terminals 11 and SO.
4. Refer to Table 55.

Table 55 — Economizer Control Board Checkout, Test 1

MOTOR TEST	PROCEDURE	EXPECTED RESULT AND RESPONSE
A	Turn minimum position potentiometer fully counterclockwise.	Motor drives closed. If not, check minimum position jumper between terminals Z and Y, and check terminal W and T1 connections to motor.
B	Turn minimum position potentiometer fully clockwise.	Motor drives open. If not, check terminal B and R connections to the motor.

Test 2:

1. Apply 24 VAC power to terminals T0 and T2 of the control board.
2. Apply 24 v between terminals 1 and T2, and jumper terminal T0 to terminal 1.
3. Remove the mixed-air sensor connected between terminals S1 and S2, and replace it with a 5490-ohm resistor.
4. Remove outdoor-air enthalpy sensor between terminals + + and SO, and replace it with a 1.2 kOhm resistor.
5. Turn the minimum position potentiometer fully counterclockwise.
6. Refer to Table 56.

Table 56 — Economizer Control Board Checkout, Test 2

MOTOR TEST	PROCEDURE	EXPECTED RESULT AND RESPONSE
A	Turn enthalpy set point potentiometer to the A position.	1. The relays energize. If not, check return enthalpy resistor. If resistor is o.k., control board is faulty. 2. Motor drives open. If relays energize, but motor does not drive open, the control board is faulty.
B	Turn enthalpy set point potentiometer to the D position.	1. The relays deenergize. If not, control board is faulty. 2. Motor drives closed. If relays deenergize by motor does not drive closed, the control board is faulty.

Test 3:

1. Apply 24 VAC power to terminals T0 and T2 of the control board.
2. Apply 24 v between terminals 1 and T2, and jumper terminal T0 to terminal 1.
3. Remove the mixed-air sensor connected between terminals S1 and S2, and replace it with a 5490-ohm resistor.
4. Remove outdoor-air enthalpy sensor between terminals ++ and SO, and replace it with a 1.2 kOhm resistor.
5. Turn the minimum position potentiometer fully counterclockwise.
6. Turn enthalpy set point potentiometer to the A setting.
7. Refer to Table 57.

Table 57 — Economizer Control Board Checkout, Test 3

MOTOR TEST	PROCEDURE	EXPECTED RESULT AND RESPONSE
A	Turn mixed-air potentiometer to the midpoint position.	Motor should drive to mid-stroke with the set point set between 60 and 70 F. If not, the control board is faulty.
B	Turn mixed-air potentiometer fully counterclockwise.	Motor drives open, If not, the control board is faulty.
	Turn mixed-air potentiometer fully clockwise.	Motor drives closed. If not, the control board is faulty.

Test 4

Refer to Table 58 for the correct procedure for test 4.

Unit Control Board Checkout — The following tools are required to perform the troubleshooting tasks detailed in this section:

- 1.5-v battery
- 2 sets of jumper wires with alligator clips
- Multimeter
- Toggle switch with 14-in. wires terminated with $^1/_4$-in. spade connectors

⚠ DANGER

Read these instructions completely before attempting to troubleshoot the control board. Failure to follow the steps precisely could result in damage to unit, personal injury, or death.

The control board checkout procedure consists of 2 parts: A basic check to verify availability of 24 and 115 v to the control board and a detailed check of each circuit within the board.

Table 58 — Economizer Control Board Checkout, Test 4

MOTOR TEST	PROCEDURE	EXPECTED RESULT AND RESPONSE
A (Outdoor-Air Sensor)	1. Connect the enthalpy sensor terminal 1 to terminal + on the motor. 2. Connect the positive terminal of a DC milliammeter to terminal S of the sensor. 3. Connect the negative terminal of a DC milliammeter to terminal S_o of the enthalpy board.	Milliammeter reading should be between 3 and 24 mA if the sensor is operating correctly. If the reading is 0 mA, the sensor is either wired backward or is defective.
B (Indoor-Air Sensor)	1. Connect the enthalpy sensor terminal + to terminal + on the motor. 2. Connect the positive terminal of a DC milliammeter to terminal S of the sensor. 3. Connect the negative terminal of a DC milliammeter to terminal S_R of the enthalpy board.	Milliammeter reading should be between 3 and 24 mA if the sensor is operating correctly. If the reading is 0 mA, the sensor is either wired backward or is defective.

BASIC CHECK — Refer to Fig. 136 for control board component identification.

NOTE: All plugs (except P1) are labeled for easy identification. Plug P1 can be identified by its orange color.

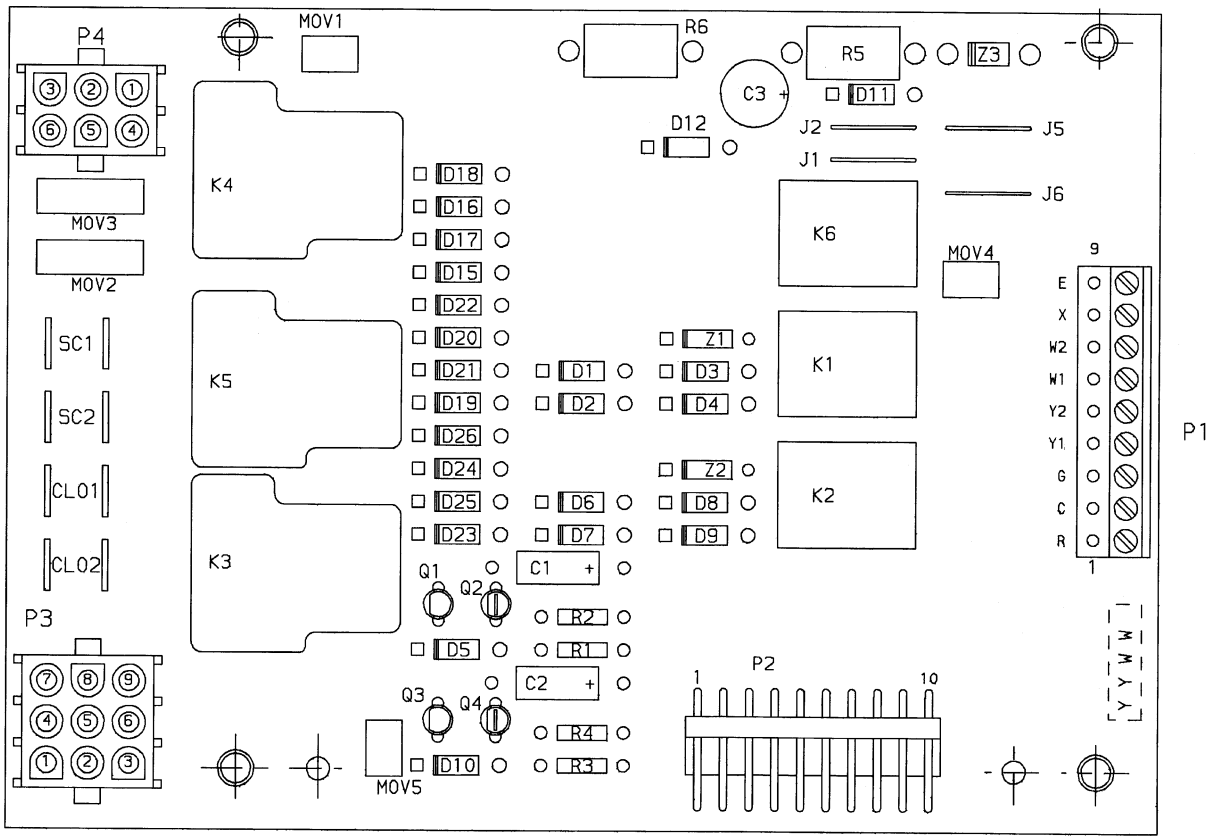
1. Turn unit power off. Disconnect plug P1 from control board.
2. Turn unit power on and check voltage across Pin R and Pin C at plug P1. If voltage reads 18 to 30 v, skip to Step 5.
3. Turn unit power off. Disconnect plug P3.
4. Turn unit power on and measure voltage across wires on plug P3, Pins 1 and 2 (wires coming from the unit). If voltage reads 18 to 30 v, there is either a bad connection between plug P3 and control board, or the control board is defective. Verify the connection at this point and proceed to Step 5. If there is no voltage, check the circuit breaker and transformer in the 24-v control circuit of the unit.
5. Turn unit power off and disconnect plug P4 from the control board.
6. Switch scale on meter to read 115 v.
7. Turn unit power on and check voltage across Pin 6 on plug P4 and unit ground (wires coming from the unit). If voltage reads 104 to 122 v, there is adequate power available to the board. Verify connection at this point and proceed to Step 8. If there is no voltage, check the circuit breaker and transformer in the 115-v control circuit of the unit.
8. After verifying that 24-v and 115-v supply power is available to the control board, turn unit power off and reconnect plugs P1, P3, and P4. Proceed to Detailed Check section following.

DETAILED CHECK

NOTE: Plug P1 must be disconnected in order to perform any of the troubleshooting steps detailed in this section. To save time, reconnect plug P1 only after you have completed all of the required troubleshooting.

Symptom: Evaporator fan will not operate.

1. Turn unit power off and disconnect plug P1 from the control board.
2. Install a jumper across Pin R and Pin G at plug P1 on the control board.
3. Turn unit power on and check if the indoor (evaporator) fan contactor (IFC) coil has been pulled in. If the contactor has not been pulled in, check the voltage across the IFC coil. If there is voltage at this point, the IFC contactor is defective. If there is no voltage, proceed to Step 4.
4. Turn unit power off and disconnect plug P4 from the control board.
5. Turn unit power on and check for continuity across Pin 6 and Pin 3 at plug P4 on the control board. If there is no continuity, the board is defective. Replace control board. If there is continuity, then there is a bad connection between the board and plug P4. Correct the connection.
6. Turn unit power off. Reconnect plug P1 (if troubleshooting is complete) and plug P4.



LEGEND

CLO — Compressor Lockout
P — Plug
SC — Safety Circuit

Fig. 136 — Control Board Component Arrangement

Symptom: Condenser fan no. 1 will not operate.

1. Turn unit power off. Disconnect plugs P1 and P3 from the control board.
2. Check for continuity between Pin 8 at plug P3 on the control board and Pin Y1 at plug P1 on the control board. If there is no continuity, the board is defective. If there is continuity, either the connection is bad between plug P3 and the control board or the problem is external to the board. Reconnect plug P1 (if troubleshooting is complete) and plug P3 to the board.

Symptom: Condenser fan no. 2-5 will not operate.

1. Check operation of condenser fan no. 1. If fan no. 1 operates properly, the problem is external to the board.

Symptom: Compressor no. 1 will not operate.

1. Turn unit power off. Disconnect the 2 wires attached to the terminals marked SC1.
2. Check continuity between the 2 wires. If there is no continuity, the problem is external to the control board (possibly the pressure switches). If there is continuity, proceed to Step 3.
3. Reconnect the wires removed in Step 1.
4. With the unit power still off, disconnect plug P1 from control board. Install a jumper wire across Pin R and Pin Y1 at plug P1 on the control board.
5. Connect a voltmeter across the coil for compressor no. 1 contactor.
6. Energize unit and monitor the voltage for a few seconds.

IMPORTANT: Do not run compressor too long.

7. a. If proper voltage is indicated at the contactor, but contactor fails to close, replace contactor.
   b. If voltage is indicated for a few seconds (i.e., the contactor momentarily pulls in and is then deenergized), the compressor lockout (CLO) logic has shut down the unit. This is an indication that the board is not sensing proper compressor current, or that one of the safeties has tripped. Proceed to Step 8 to verify compressor lockout logic operation.
   c. If proper voltage is indicated at the contactor and contactor closes, the board is operating properly.
8. To verify compressor lockout logic:
   a. Disconnect CLO sensor wires connected to CLO1 at the control board. Check wires for continuity. If there is no continuity, replace the sensor.
   b. Connect the multimeter to read voltage between Pin X at plug P1 and ground.
   c. Turn unit power on and check the multimeter. Within a few seconds the meter should indicate 24 v. If it does not, the control board is defective and must be replaced.
   d. Turn unit power off. Use a toggle switch to connect a fresh 1.5-v battery to the terminals marked CLO1 as shown in Fig. 137.

⚠ CAUTION

The negative (–Ve) pole of the battery must be connected to the inner terminal, and the positive (+Ve) pole must be connected to the outer terminal as shown in Fig. 137.

   e. Turn unit power on and use the toggle switch to make and break the connection between the outer CLO1 terminal and the positive (+Ve) pole of the battery.
   f. If the multimeter shows 24 v when the battery is disconnected and no voltage when the battery is connected, the CLO logic is good. If the multimeter shows no change, the CLO logic is defective and the board must be replaced.

Symptom: Compressor no. 2 will not operate.

1. Be sure unit power is off. Disconnect the 2 wires attached to the terminals marked SC2.
2. Check continuity between the 2 wires. If there is no continuity, the problem is external to the control board (possibly the pressure switches). If there is continuity, proceed to Step 3.
3. Reconnect the wires removed in Step 1.
4. With unit power still off, disconnect plug P1 from the control board and install jumper wire across Pins R and Y2 at plug P1.
5. Connect a voltmeter across the coil for compressor no. 2 contactor.
6. Energize unit and monitor the voltage for a few seconds.

IMPORTANT: Do not run compressor too long.

7. a. If proper voltage is indicated at the contactor, but contactor fails to close, replace contactor.
   b. If voltage is indicated for a few seconds (i.e., the contactor momentarily pulls in and is then deenergized), the Compressor Lockout (CLO) logic has shut down the unit. This is an indication that the board is not sensing proper compressor current, or that one of the safeties has tripped. Proceed to Step 8 to verify compressor lockout logic operation.
   c. If proper voltage is indicated at the contactor and contactor closes, the board is operating properly.
8. To verify compressor lockout logic:
   a. Disconnect CLO sensor wires connected to CLO2 at the control board. Check wires for continuity. If there is no continuity, replace the sensor.
   b. Connect the multimeter to read voltage between Pin X on plug P1 and ground.
   c. Turn unit power on and check the multimeter. Within a few seconds the meter should indicate 24 v. If it does not, the control board is defective and must be replaced.
   d. Turn unit power off. Connect a fresh 1.5-v battery to terminals marked CLO2 as shown in Fig. 137.

⚠ CAUTION

The negative (–Ve) pole of the battery must be connected to the inner terminal, and the positive (±Ve) pole must be connected to the outer terminal as shown in Fig. 137.

   e. Turn unit power on. Make and break the connection between the outer CLO2 terminal and the positive (±Ve) pole of the battery.
   f. If the multimeter shows 24 v when the battery is disconnected and no voltage when the battery is connected, the CLO logic is good. If the multimeter shows no change, the CLO logic is defective and the board must be replaced. Remove all jumpers and replace all plugs except plug P1. (Replace plug P1 only if no further troubleshooting is required.)

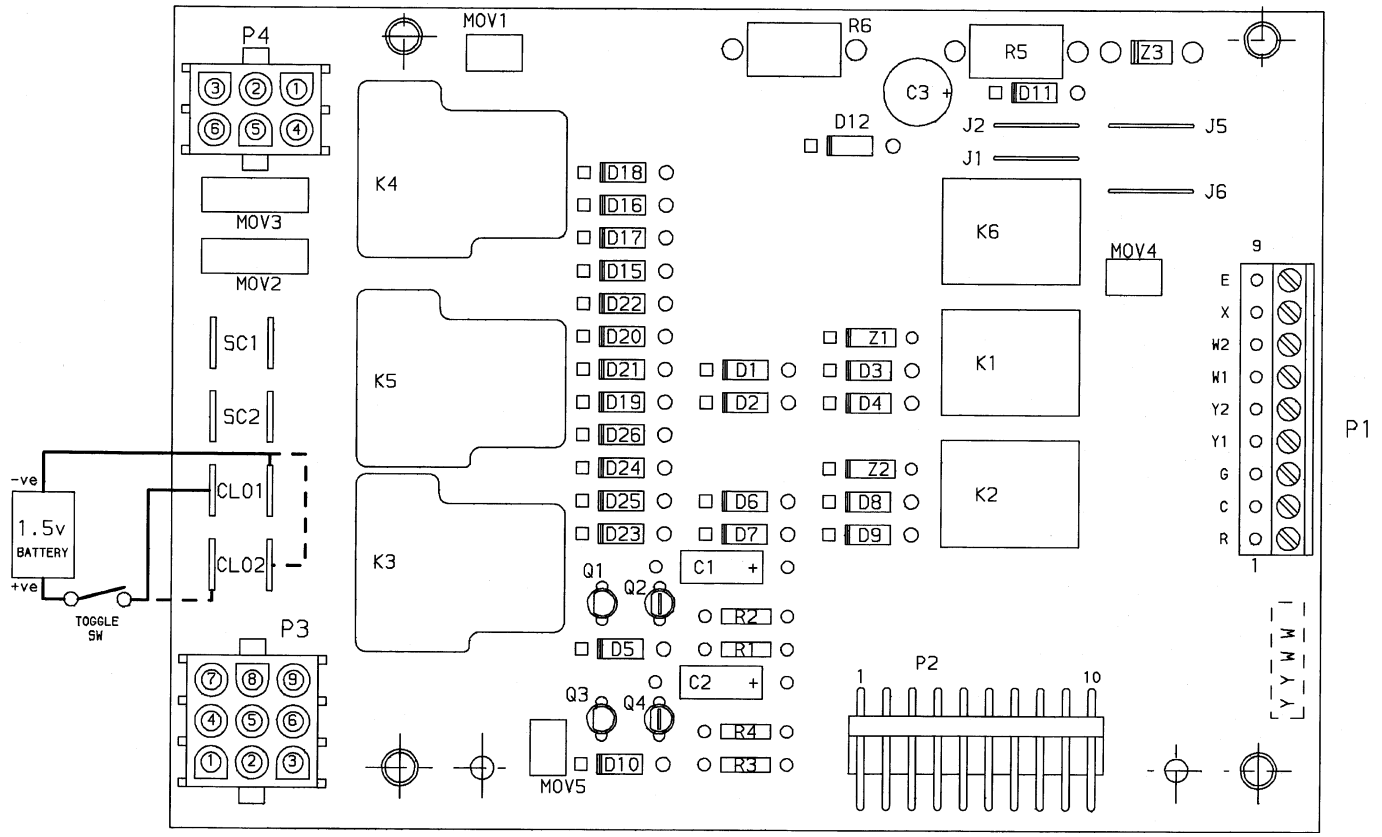
Symptom: First or second stage of heating will not operate.

1. Turn unit power off. Disconnect plugs P1 and P3.
2. Check continuity between Pin W1 at plug P1 and Pin 5 at plug P3. If there is continuity, the board is good and the problem is either the connection at P3, or external to the control board. If there is no continuity, the control board is defective and must be replaced.
3. Check continuity between Pin W2 at plug P1 and Pin 7 at plug P3. If there is continuity, the board is good and the problem is either at the connection at plug P3 or external to the board. If there is not continuity, the board is defective and must be replaced. Reconnect plug P3 to the control board. (Reconnect plug P1 only if no further troubleshooting is required.)

Symptom: Evaporator fan will not energize on a call for heat.

1. Turn unit power off. Disconnect plug P1 and plug P4.
2. Install jumper wire between Pin R and Pin W1 at plug P1.
3. Turn unit power on. Check for continuity between Pin 6 and Pin 3 at plug P4 on control board.
4. If there is no continuity between these points, the board is defective and must be replaced.

   NOTE: The control board (part number HK37AA001) has no time delay.
5. If there is continuity between these points, the problem is at the connection at plug P4 or external to the control board.
6. Turn unit power off. Reconnect plugs P1 and P4.



LEGEND

CLO — Compressor Lockout
P — Plug
SC — Safety Circuit

Fig. 137 — Compressor Lockout Connections

Power Exhaust Variable Frequency Drive

NOTE: The VFDs (part no. TOSVERT130-E3) are specially modified for use on Carrier equipment. Some specifications and control configuration defaults for Carrier applications will differ from the VFD manufacturer manual included in the packet. See Table 59 for listing of Carrier-specific default values.

BUILDING PRESSURE TRANSDUCER CONTROL — The VFD monitors and controls building pressure (BP) via a differential pressure transducer. The pressure transducer is located in the auxiliary control box. The pressure transducer's high-pressure reference port is connected to the outside of the unit cabinet by a factory-installed tubing section. The pressure transducer's low-pressure reference point must be field-connected to the building pressure pick-up (field-supplied and installed in the building).

The BP transducer monitors the static pressure in the occupied space and provides a 4 to 20 mA signal directly to the power exhaust VFD. (Refer to Table 49 for transducer output signal [mA] for actual building static pressure.) The internal logic of the power exhaust VFD compares this signal representing actual duct pressure to the user-configured BP set point. The power exhaust VFD automatically adjusts its output to the power exhaust fan motor to maintain the desired BP set point. When operating with the factory-standard BP transducer, the internal PID logic of the power exhaust VFD is enabled.

EXTERNAL SIGNAL CONTROL — If the power exhaust VFD is to be controlled by an external control system other than the factory-supplied pressure transducer, the internal PID logic function of the power exhaust VFD must be disabled. To disable the PID control:

1. Disconnect and lock out all power to the Carrier rooftop unit.
2. Remove the VFD access cover.

⚠ WARNING

Ensure the "CHARGE" lamp on the VFD is unlit. This may up to 4 minutes. The "CHARGE" lamp indicates that the main capacitors in the VFD are charged. Internal components of the VFD should not be touched until the "CHARGE" lamp is completely out. Electrical shock can cause injury or death.

3. Install a jumper across S2-CC (see Fig. 138 for power exhaust VFD terminal board connections).
4. Remove factory-supplied cable attached to IV and CC.
5. Remove other end of the same cable from the pressure sensor.
6. Connect field-supplied speed reference (4 to 20 mA) across terminals IV-P24.
7. Disable the supply fan motor operation.
8. Reconnect power to the unit and power exhaust VFD.
9. Reprogram the power exhaust VFD to accept an external reference (in the Utility parameters group [GR.Ut], set parameter item Fnod [no.312] = 4).
10. Enable supply fan motor and return power to the unit.

POWER EXHAUST FAN MOTOR NO. 1 OVERLOAD PROTECTION — The VFD provides operating overload protection for the supply fan motor. The factory has programmed the power exhaust VFD overload function to match the factory-installed motor (motor size and efficiency). If the power exhaust fan motor is changed from the original factory selection, the overload value may need to be changed by the service person. Contact your local Carrier representative for assistance in determining the proper overload setting.

NOTE: Variable frequency drive size is matched to factory-installed motor size. Do not increase motor size without also changing to equivalent VFD size.

POWER EXHAUST VFD OPERATION — When troubleshooting the power exhaust VFD, check first that all required conditions for power exhaust VFD operation are satisfied.

For the power exhaust VFD to run, the following conditions must be met at the power exhaust VFD:

1. Drive enable jumper is installed from terminals ST-CC (factory supplied) (see Fig. 138).
2. Proper rotation jumper is installed at terminals R-CC (reverse rotation, factory supplied).
3. Emergency stop jumper is installed from terminals S4-CC (factory supplied).
4. A 4 to 20 mA signal is applied across terminals IV-P24 (from pressure transducer, factory supplied).
5. DIP switch SW1 (located on the VFD's printed circuit control panel) must be set to "I" (indicating usage of a 4 to 20 mA input signal at terminals "IV").
6. Speed Control (located on the VFD's keypad/display) set for "Remote" (press the "Speed Ctrl" button until LED "Remote" is illuminated).
7. Programmed according to Carrier defaults.
8. Building Pressure set point established by user, or use factory default (30 Hz indicating 0.0 in. wg).

POWER EXHAUST VFD OPERATIONAL STATUS — The power exhaust VFDs contain extensive self-diagnostic functions which are accessed through the power exhaust VFD display panel (located on the front of the power exhaust VFD or at a remote location when the accessory remote display package has been installed.)

⚠ CAUTION

If using the VFD display panel, **disconnect all power to the unit and the VFD before entering unit**, or use the accessory remote display module. Disable supply fan and motor operation before accessing VFD-mounted display module.

When power is first supplied to the power exhaust VFD, the display automatically starts with the frequency monitor function of its standard monitor mode. In the frequency monitor function, the output frequency is displayed. Push the **S/P/M (Setup/Program/Monitor)** key to switch to the Mode Selection menu. Push the **S/P/M** key again to toggle the display back to the standard monitor mode.

From the Mode Selection menu, the service person can view all of the monitored status variables, including up to four user-selected variables and any trip history in the memory.

Refer to the separate VFD Operation Manual for detailed instructions on accessing diagnostic information, initiating troubleshooting, and clearing any trip history.

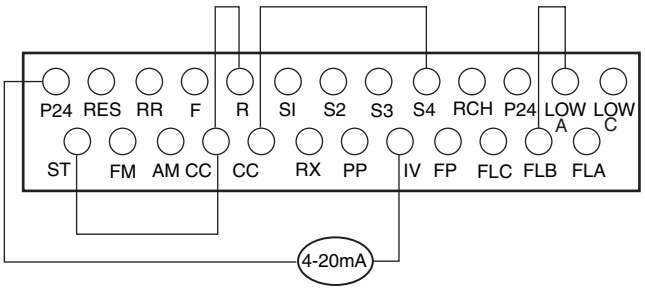


Fig. 138 — Power Exhaust Variable Frequency Drive Terminal Block

Table 59 — Power Exhaust VFD (TOSVERT130-E3) Default Program Parameter Values

PARAMETER GROUP	PARAMETER	DEFAULT VALUE
SEtP (Setup)	ACC1	60.0 Sec
	DEC1	60.0 Sec
	UL	60.0 Hz*
	LL	10.0 Hz*
	LuIn	1
	P3	20%
	F-P3	0.0 Hz
	P4	100%
	F-P4	60 Hz
	tHr1	See Tables 61 and 62
	StC1	0
	StL1	110%
	OLN	1
	tYP	5*
Gr.F (Fundamental)	FH	60 Hz
	Pt	12
Gr.Fb (Feedback)	FbP1	1*
	Fbin	2
	GP	.30
	GI	2 sec
	GA	0
	GFS	80
	P1LL	10
	PuL	1
	PuUl	10
	PuLL	10
Gr.SF (Frequency Settings)	Fsor	60 Hz
Gr.Pn (Panel Control)	Fr	0*
Gr.St (Terminal Selection)	1t	1
	1t0	0
	1t1	56
	1t2	13
	1t3	3
	1t4	10
	Ot1	4*
	Ot2	2*
	Ot2d	5*
	Ot2H	100*
	LF	15*
Gr.Pr (Protection)	UuC	1*
	UuCt	2
	ArSt	3
Gr.Ut (Utility)	Cnod	1*
	Fnod	2*
	bLPn	1*

*These settings differ from the Toshiba defaults and are required for Carrier applications.

NOTE: To restore original factory settings, change tYP to 6 in. Setup mode (SetP).
This restores the VFD (TOSVERT130-E3) original factory settings.

RESTORING FACTORY POWER EXHAUST VFD DEFAULTS — The original factory configuration values are saved in the memory of the power exhaust VFD and can be restored by the service person if required. There are two types of saved file data: Carrier-factory settings (factory programmed settings made to the power exhaust VFD which apply specifically to the unit it is installed on) and standard defaults for general Carrier unit use.

The Carrier-factory settings are maintained as user settings. These can be restored by entering the Setup mode (in the **S/P/M** menu) and setting parameter tYP = 6 on the keypad/display. This will recall the specific factory defaults for this unit.

Occasionally it may be necessary to restore the power exhaust VFD defaults to the general Carrier use values. These are stored in an OPTION ROM (read-only memory chip). However, some variables may need to be manually changed to match the specific unit's factory default settings. To recall the general Carrier defaults, enter the Setup mode and set parameter tYP = 3. Refer to Tables 60-62 for items requiring manual adjustment.

Table 60 — Power Exhaust VFD Required User Adjusted Defaults

UNIT	ITEM
ALL	Motor Overload Settings (See Tables 61 and 62)
	Gr.St/Ot1 = 4
	Gr.St/Ot2 = 2
	Gr.St/Ot2d = 5
	Gr.St/Ot2H = 100
	Gr.St/LF = 15
	SEtP/UL = 60.0
	SEtP/P4 = 100
	SetP/LL = 10.0
	SetP/tYP = 5
	Gr. Fb/FbP1 = 1
	Gr. Pn/Fr = 0
	Gr. Pr/UuC = 1
	Gr. Ut/Cnod = 1
	Gr. Ut/Fnod = 2
	Gr. Ut/bLPn = 1

Table 61 — Power Exhaust Fan Motor Overload Setting (tHr1) — Sizes 030-070

MOTOR (hp)	HIGH EFFICIENCY				PREMIUM EFFICIENCY		
	PE Letter*	230V	460V	575V	PE Letter*	230V	460V
6	G†	98.4	75.08	84.04	Q†	98.4	75.08
10	H	96.6	97.3	90.9	R	96.6	97.3
15	J	78.3	100.0	100.0	S	78.3	100.0
20	K	87.3	100.0	95.1	T	87.3	100.0

*Outdoor Air Power Exhaust Option of the unit model number in the 16th Position.
†030-050 units only.

Table 62 — Power Exhaust Fan Motor Overload Setting (tHr1) — Sizes 075 to 105

MOTOR (hp)	HIGH EFFICIENCY			PREMIUM EFFICIENCY	
	PE Letter*	460V	575V	PE Letter*	460V
10	F	97.3	90.9	M	97.3
15	G	100.0	100.0	N	100.0
20	H	100.0	95.1	P	100.0
High-Capacity Power Exhaust (Size 75 to 105 ton)					
20	—	100.0	95.1	E	100.0
30	A	92.3	100.0	F	92.3
40	B	84.6	90.1	G	84.6
50	C	92.2	—	H	92.2
60	D	86.0	—	J	86.0
High-Capacity Power Exhaust with Plenum (Size 75 to 105 ton)					
20	Q	100.0	95.1	V	100.0
25	R	93.5	100.0	W	93.5
30	S	92.3	100.0	Z	92.3
40	T	84.6	90.1	Y	84.6

*Outdoor Air Power Exhaust Option of the unit model number in the 16th Position.

Return/Exhaust Fan Variable Frequency Drive

⚠ WARNING

Factory-installed optional VFD is located near the return/exhaust fan and motor. During any service work or programming at the VFD, operation of the fan and motor is not desirable. Either disable the return/exhaust fan or install an accessory VFD remote display. Physical injury could result.

NOTE: The RE VFD (part no. TOSVERT130-E3) is specially modified for use on Carrier equipment. Some specifications and control configuration defaults for Carrier applications will differ from the VFD manufacturer manual included in the packet. See Table 63 for listing of Carrier-specific default values.

TRANSDUCER CONTROL — The VFD monitors and controls the mixing box pressure at the filter section via a differential pressure transducer. The pressure transducer is located in the auxiliary control box. The pressure transducer's high-pressure reference port is connected to the outside of the unit cabinet. The pressure transducer's low-pressure reference port is connected to the pick-up sensor at the filter section. Both ports are factory-installed.

The mixing box pressure transducer (MBPT) monitors the static pressure in the mixing box and provides a 4 to 20 mA signal directly to the return/exhaust VFD. The internal logic of the RE VFD compares this signal representing actual mixing box pressure to the pressure set point. The RE VFD automatically adjusts its output to the power exhaust fan motor to maintain the desired set point.

The MBPT has a range of –0.5 to +0.5 in. wg. The output is a 4 to 20 mA signal, scaled to this range. The RE VFD translates the 4 to 20 mA signal to represent a frequency value over the control range of 0 to 60 Hz. See Table 49. The set point for the mixing box pressure control is established at the RE VFD keypad in terms of Hz. The factory default set point is 21 Hz, representing a mixing box pressure of –0.15 in. wg.

DETERMINE RE VFD SET POINT — The mixing box pressure set point will control the amount of outside air volume at a given minimum economizer damper position. By increasing the set point, there will be less outside air coming in from the economizer. Decreasing the set point will bring in more outside air. The factory default set point should meet most of the application needs, but it can be changed through the VFD keypad. To convert the desired MBP into the RE VFD set point, refer to Table 49. Locate the pressure value in the table closest to the desired MBP for the application and use the corresponding set point (Hz) value. If necessary, interpolation between duct static pressure values is permissible. The set point should always be lower than 30 Hz (0.0 in. wg).

ADJUST RE VFD SET POINT — To adjust the RE VFD set point, the RE VFD must be powered. Since it is located in the indoor section of the unit, use caution to ensure that the service access door is blocked open and will not close suddenly. Change RE VFD set point according to Table 49.

RETURN/EXHAUST FAN MOTOR OVERLOAD PROTECTION — The VFD provides operating overload protection for the supply fan motor. The factory has programmed the RE VFD overload function to match the factory-installed motor (motor size and efficiency). If the power exhaust fan motor is changed from the original factory selection, the overload value may need to be changed by the service person. Contact your local Carrier representative for assistance in determining the proper overload setting.

NOTE: Variable frequency drive size is matched to factory-installed motor size. Do not increase motor size without also changing to equivalent VFD size.

RETURN/EXHAUST VFD OPERATION — When troubleshooting the power exhaust VFD, check first that all required conditions for RE VFD operation are satisfied.

For the RE VFD to run, the following conditions must be met at the power exhaust VFD (see Fig. 139):

1. Drive enable jumper is installed from terminals ST-CC (factory supplied).
2. Proper rotation jumper is installed at terminals F-CC (forward rotation, factory installed).
3. Emergency stop jumper is installed from terminals S4-CC (factory installed).
4. A 4 to 20 mA signal is applied across terminals IV-P24 (from pressure transducer, factory supplied).
5. DIP switch SW1 (located on the VFD's printed circuit control panel) must be set to "I" (indicating usage of a 4 to 20 mA input signal at terminals "IV").
6. Speed Control (located on the VFD's keypad/display" set to "Remote" (press the "Speed Ctrl" button until LED "Remote" is illuminated).
7. Programmed according to Carrier defaults.
8. Mixing Box Pressure set point established by user, or use factory default (21 Hz indicating –0.15 in. wg)

RETURN/EXHAUST VFD OPERATIONAL STATUS — The RE VFDs contain extensive self-diagnostic functions which are accessed through the RE VFD display panel (located on the front of the RE VFD or at a remote location when the accessory remote display package has been installed).

⚠ CAUTION

If using the VFD display panel**, disconnect all power to the unit and the VFD before entering unit**, or use the accessory remote display module. Disable supply fan and motor operation before accessing VFD-mounted display module.

When power is first supplied to the return/exhaust fan VFD, the display automatically starts with the frequency monitor function of its standard monitor mode. In the frequency monitor function, the output frequency is displayed. Push the S/P/M **(Setup/Program/Monitor)** key to switch to the Mode Selection menu. Push the S/P/M key again to toggle the display back to the standard monitor mode.

From the Mode Selection menu, the service person can view all of the monitored status variables, including up to four user-selected variables and any trip history in the memory.

Refer to the separate VFD Operation Manual for detailed instructions on accessing diagnostic information, initiating troubleshooting and clearing any trip history.

RESTORING FACTORY RE VFD DEFAULTS — The original factory configuration values are saved in the memory of the RE VFD and can be restored by the service person if required. There are two types of saved file data: Carrier-factory settings (factory programmed settings made to the RE VFD which apply specifically to the unit it is installed on) and standard defaults for general Carrier unit use.

The Carrier-factory settings are maintained as user settings. These can be restored by entering the Setup mode (in the S/P/M menu) and setting parameter tYP=6 on the keypad/display. This will recall the specific factory defaults for this unit.

Occasionally it may be necessary to restore the RE VFD defaults to the general Carrier use values. These are stored in an OPTION ROM (read-only memory chip). However, some variables may need to be manually changed to match the specific unit's factory default settings. To recall the general Carrier defaults, enter the Setup mode and set parameter tYP=3. Refer to Tables 64 and 65 for items requiring manual adjustment.

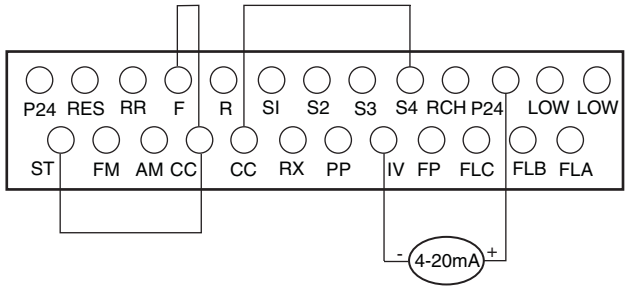


Fig. 139 — Return Fan Variable Frequency Drive Terminal Block

Table 63 — Carrier Default Program Parameter Values (Return Fan VFD)

PARAMETER GROUP	PARAMETER	DEFAULT VALUE
SEtP (Setup)	ACC1	120.0 Sec*
	DEC1	120.0 Sec*
	UL	60.0 Hz
	LL	10.0 Hz*
	Luln	1
	P3	20%
	F-P3	0.0 Hz
	P4	100%
	F-P4	60 Hz
	tHr1	See Table 65
	StC1	0
	StL1	110%
	OLN	1
	tYP	5*
Gr.F (Fundamental)	FH	60 Hz*
	Pt	2
Gr.Fb (Feedback)	FbP1	1*
	Fbln	2
	GP	.30
	GI	2 sec
	GA	0
	GFS	80
	P1LL	5*
	PuL	1
	PuUl	10
	PuLL	10
Gr.St (Terminal Selection)	1t	1
	1t0	0
	1t1	56
	1t2	13
	1t3	3
	1t4	10
Gr.Pr (Protection)	UuC	1*
	UuCt	2
	ArSt	3
Gr.Ut (Utility)	Cnod	1*
	bLSF	1*
	Fnod	2*
	bLPn	1*

*These settings differ from the Toshiba defaults and are required for Carrier applications.

NOTE: To restore original factory settings, change tYP to 6 in Setup mode (SEtP). This restores the VFD original factory settings.

Table 64 — Return/Exhaust Fan VFD Required User Adjusted Defaults

UNIT	ITEM
	Motor Overload Settings (see Table 65)
48ZC,ZL,ZR075-105 Units	1. Check jumper CC-F 2. Gr. UT/bLSF = 1 3. SEtP/tYP = 5 (Save User Settings) 4. SEtP/ACC1 = 120.0 5. SEtP/DEC1 = 120.0 6. SEtP/LL = 10.0 7. Gr. F/FH = 60 8. Gr. Fb/FbP1 = 1 9. Gr. Fb/P1LL = 5 10. Gr. Pr/UuC = 1 11. Gr. Ut/Cnod = 1 12. Gr. Ut/bLSF = 1 13. Gr. Ut/Fnod = 2 14. Gr. Ut/bLPn = 1

Table 65 — Return/Exhaust Fan Motor Overload Settings

UNIT 48	UNIT VOLTAGE DESIGNATION Model No. Position 12		MOTOR HP DESIGNATION Model No. Position 16	tHr1 SETTING
ZC,ZL,ZR	6	and	Q,V	98.0
	6	and	R,W	87.0
	6	and	S,X	82.0
	6	and	T,Y	85.0

IGC Troubleshooting — Refer to Fig. 140 for Integrated Gas Unit Controller troubleshooting.

Unit Wiring — A typical wiring schematic is shown in Fig. 141-145.

TROUBLESHOOTING AND DIAGNOSTICS

PROBLEM	SOLUTION
COMPRESSOR DOES NOT RUN	
Contactor Open	
1. Power off.	1. Restore power.
2. Fuses blown in field power circuit.	2. After finding cause and correcting, replace with correct size fuse.
3. No control power.	3. Check secondary fuse(s); replace with correct type and size. Replace transformer if primary windings receiving power.
4. Compressor circuit breaker tripped.	4. Check for excessive compressor current draw. Reset breaker; replace if defective.
5. Safety device lockout circuit active.	5. Reset lockout circuit at circuit breaker.
6. Low-pressure switch open.	6. Check for refrigerant undercharge, obstruction of indoor airflow, or whether compressor suction shutoff valve is fully open. Make sure liquid line solenoid valve(s) is open.
7. High-pressure switch open.	7. Check for refrigerant overcharge, obstruction of outdoor airflow, air in system or whether compressor discharge valve is fully open. Be sure outdoor fans are operating correctly.
8. Loose electrical connections.	8. Tighten all connections.
9. Compressor stuck.	9. See 06E compressor service literature.
Contactor Closed	
1. Compressor leads loose.	1. Check connections.
2. Motor windings open.	2. See 06E compressor service literature.
3. Single phasing.	3. Check for blown fuse. Check for loose connection at compressor terminal.
COMPRESSOR STOPS ON HIGH-PRESSURE SWITCH	
Outdoor Fan On	
1. High-pressure switch faulty.	1. Replace switch.
2. Airflow restricted.	2. Remove obstruction.
3. Air recirculating.	3. Clear airflow area.
4. Noncondensables in system.	4. Purge and recharge as required.
5. Refrigerant overcharge.	5. Purge as required.
6. Line voltage incorrect.	6. Consult power company.
7. Refrigerant system restrictions.	7. Check or replace filter drier, expansion valve, etc. Check that compressor discharge valve is fully open.
Outdoor Fan Off	
1. Fan slips on shaft.	1. Tighten fan hub setscrews.
2. Motor not running.	2. Check power and capacitor.
3. Motor bearings stuck.	3. Replace bearings.
4. Motor overload open.	4. Check overload rating. Check for fan blade obstruction.
5. Motor burned out.	5. Replace motor.
COMPRESSOR CYCLES ON LOW-PRESSURE SWITCH	
Indoor-Air Fan Running	
1. Filter drier plugged.	1. Replace filter drier.
2. Expansion valve power head defective.	2. Replace power head.
3. Low refrigerant charge.	3. Add charge. Check low-pressure switch setting.
Airflow Restricted	
1. Coil iced up.	1. Check refrigerant charge.
2. Coil dirty.	2. Clean coil fins.
3. Air filters dirty.	3. Clean or replace filters.
4. Dampers closed.	4. Check damper operation and position.
Indoor-Air Fan Stopped	
1. Electrical connections loose.	1. Tighten all connections.
2. Fan relay defective.	2. Replace relay.
3. Motor overload open.	3. Power supply.
4. Motor defective.	4. Replace motor.
5. Fan belt broken or slipping.	5. Replace or tighten belt.

LEGEND

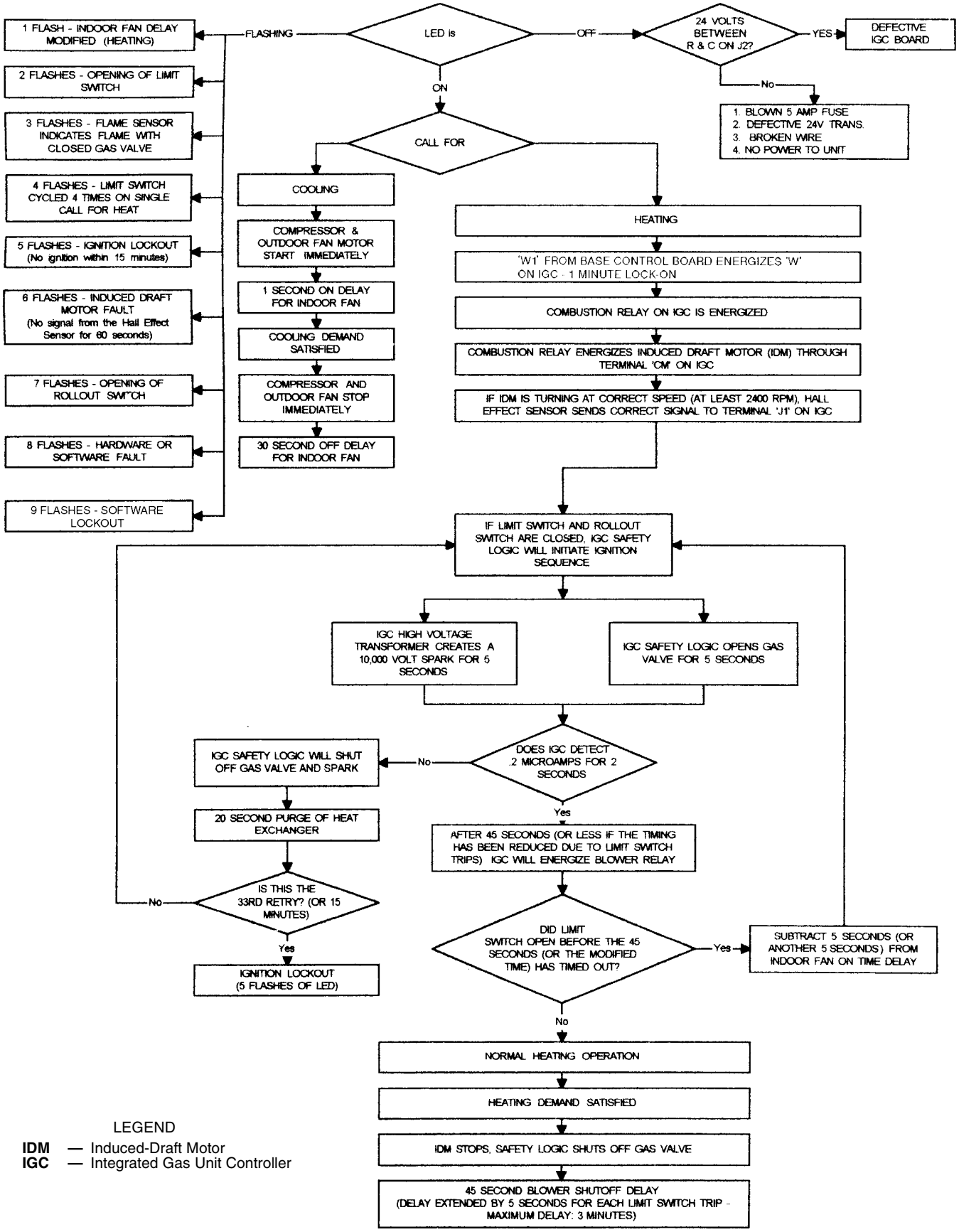
PSIO — Processor Module
VFD — Variable Frequency Drive

TROUBLESHOOTING AND DIAGNOSTICS (cont)

PROBLEM	SOLUTION
COMPRESSOR RUNNING BUT COOLING INSUFFICIENT	
Suction Pressure Low	
1. Refrigerant charge low.	1. Add refrigerant.
2. Head pressure low.	2. Check refrigerant charge.
3. Air filters dirty.	3. Clean or replace filters.
4. Expansion valve power head defective.	4. Replace power head.
5. Indoor coil partially iced.	5. Check low-pressure setting.
6. Indoor airflow restricted.	6. Remove obstruction.
Suction Pressure High	
1. Unloaders not functioning.	1. Check unloader adjustments. Check unloader setting.
2. Compressor valve defective.	2. See 06E compressor service literature.
3. Heat load excessive.	3. Check for open doors or windows in vicinity of fan coil.
UNIT OPERATES TOO LONG OR CONTINUOUSLY	
1. Low refrigerant charge.	1. Add refrigerant
2. Control contacts fused.	2. Replace control.
3. Air in system.	3. Purge and evacuate system.
4. Partially plugged expansion valve or filter drier.	4. Clean or replace.
SYSTEM IS NOISY	
1. Piping vibration.	1. Support piping as required.
2. Compressor noisy.	2. Check valve plates for valve noise. Replace compressor if bearings are worn.
COMPRESSOR LOSES OIL	
1. Leak in system.	1. Repair leak.
2. Crankcase heaters not energized during shutdown.	2. Check wiring and relays. Check heater and replace if defective.
FROSTED SUCTION LINE	
Expansion valve admitting excess refrigerant.	Adjust expansion valve.
HOT LIQUID LINE	
1. Shortage of refrigerant due to leak.	1. Repair leak and recharge.
2. Expansion valve opens too wide.	2. Adjust expansion valve.
FROSTED LIQUID LINE	
Restricted filter drier.	Remove restriction or replace.
CONTACTOR OPEN	
1. Power off.	1. Restore power.
2. Fuses blown in field power circuit.	2. After finding cause and correcting, replace with correct fuses.
3. No control power.	3. Check secondary fuses. Replace with correct type and size. Replace transformer if primary windings are receiving power.
CONTACTOR CLOSED	
1. VFD overload function tripped.	1. Refer to separate VFD technical manual for troubleshooting instructions.
2. Motor leads loose.	2. Check connections at motor lead junction box.
3. Motor windings open.	3. Check motor windings.
4. Single phasing.	4. Check for blown fuse. Check for loose connections at motor junction box.
5. Belts broken or thrown.	5. Check belts. Replace as complete set if necessary.
6. Fan status switch contacts defective.	6. Check for input signal at PSIO no. 1, channel 12. Replace switch if defective.

LEGEND

PSIO — Processor Module
VFD — Variable Frequency Drive


1 FLASH - INDOOR FAN DELAY MODIFIED (HEATING)
2 FLASHES - OPENING OF LIMIT SWITCH
3 FLASHES - FLAME SENSOR INDICATES FLAME WITH CLOSED GAS VALVE
4 FLASHES - LIMIT SWITCH CYCLED 4 TIMES ON SINGLE CALL FOR HEAT
5 FLASHES - IGNITION LOCKOUT (No ignition within 15 minutes)
6 FLASHES - INDUCED DRAFT MOTOR FAULT (No signal from the Hall Effect Sensor for 60 seconds)
7 FLASHES - OPENING OF ROLLOUT SWITCH
8 FLASHES - HARDWARE OR SOFTWARE FAULT
9 FLASHES - SOFTWARE LOCKOUT
FLASHING
LED is
OFF
24 VOLTS BETWEEN R & C ON J2?
YES
DEFECTIVE IGC BOARD
No
1. BLOWN 5 AMP FUSE
2. DEFECTIVE 24V TRANS.
3. BROKEN WIRE
4. NO POWER TO UNIT
ON
CALL FOR
COOLING
COMPRESSOR & OUTDOOR FAN MOTOR START IMMEDIATELY
1 SECOND ON DELAY FOR INDOOR FAN
COOLING DEMAND SATISFIED
COMPRESSOR AND OUTDOOR FAN STOP IMMEDIATELY
30 SECOND OFF DELAY FOR INDOOR FAN
HEATING
'W1' FROM BASE CONTROL BOARD ENERGIZES 'W' ON IGC - 1 MINUTE LOCK-ON
COMBUSTION RELAY ON IGC IS ENERGIZED
COMBUSTION RELAY ENERGIZES INDUCED DRAFT MOTOR (IDM) THROUGH TERMINAL 'CM' ON IGC
IF IDM IS TURNING AT CORRECT SPEED (AT LEAST 2400 RPM), HALL EFFECT SENSOR SENDS CORRECT SIGNAL TO TERMINAL 'J1' ON IGC
IF LIMIT SWITCH AND ROLLOUT SWITCH ARE CLOSED, IGC SAFETY LOGIC WILL INITIATE IGNITION SEQUENCE
IGC HIGH VOLTAGE TRANSFORMER CREATES A 10,000 VOLT SPARK FOR 5 SECONDS
IGC SAFETY LOGIC OPENS GAS VALVE FOR 5 SECONDS
DOES IGC DETECT .2 MICROAMPS FOR 2 SECONDS
No
IGC SAFETY LOGIC WILL SHUT OFF GAS VALVE AND SPARK
20 SECOND PURGE OF HEAT EXCHANGER
IS THIS THE 33RD RETRY? (OR 15 MINUTES)
No
Yes
IGNITION LOCKOUT (5 FLASHES OF LED)
Yes
AFTER 45 SECONDS (OR LESS IF THE TIMING HAS BEEN REDUCED DUE TO LIMIT SWITCH TRIPS) IGC WILL ENERGIZE BLOWER RELAY
DID LIMIT SWITCH OPEN BEFORE THE 45 SECONDS (OR THE MODIFIED TIME) HAS TIMED OUT?
Yes
SUBTRACT 5 SECONDS (OR ANOTHER 5 SECONDS) FROM INDOOR FAN ON TIME DELAY
No
NORMAL HEATING OPERATION
HEATING DEMAND SATISFIED
IDM STOPS, SAFETY LOGIC SHUTS OFF GAS VALVE
45 SECOND BLOWER SHUTOFF DELAY (DELAY EXTENDED BY 5 SECONDS FOR EACH LIMIT SWITCH TRIP - MAXIMUM DELAY: 3 MINUTES)
LEGEND
IDM — Induced-Draft Motor
IGC — Integrated Gas Unit Controller

NOTE: Thermostat Fan Switch in the “AUTO” position or sensor-equipped unit.

Fig. 140 — IGC Control (Heating)

LEGEND FOR FIG. 141-145

AFS — Air Flow Switch
C — Contactor
CB — Circuit Breaker
CCB — Control Circuit Breaker
CH — Crankcase Heater
CLO — Compressor Lockout
CLSASP — Cooling Supply Air Set Point
COMP — Compressor
CR — Compressor Relay
CV — Constant Volume
DMS — Damper Motor Switch
DPS — Duct Pressure Switch
DU — Dummy
EC — Enthalpy Control
ECON — Economizer
EQUIP — Equipment
FU — Fuse
GND — Ground
GVR — Gas Valve Relay
HIR — Heat Interlock Relay
HPCT — Head Pressure Control Thermostat
HPS — High-Pressure Switch
HR — Heat Relay
HS — Heat Sensor
HTSASP — Heating Supply Air Set Point
I — Ignitor
IDM — Induced Draft Motor
IFC — Indoor (Supply) Fan Contactor
IFCB — Indoor (Supply) Fan Circuit Breaker
IFM — Indoor (Supply) Fan Motor
IGC — Integrated Gas Controller
LIMTEMP — Limit Switch Thermistor
LPS — Low-Pressure Switch
LS — Limit Switch
MAT — Mixed Air Thermostat
MGV — Main Gas Valve
NC — Normally Closed
NEC — National Electrical Code
NEUT — Neutral
NO — Normally Open
OFC — Outdoor (Condenser) Fan Contactor
OFM — Outdoor (Condenser) Fan Motor
PCB — Power Exhaust Circuit Breaker
PEC — Power Exhaust Contactor
PEDM — Power Exhaust Damper Motor
PEDMS — Power Exhaust Damper Motor Switch
PEM — Power Exhaust Motor
P, PL — Plug
PRI — Primary
RCB — Return Fan Circuit Breaker
RFC — Return Fan Contactor
RFM — Return Fan Motor
RS — Rollout Switch
SAT — Supply Air Thermistor
SC — Safety Circuit
SEC — Secondary
SEN,SN — Sensor
SGC — Staged Gas Controller
TB — Terminal Block
TRAN — Transformer
V — Voltage
– – – – Field Wiring
——— Factory Wiring

NOTES:
1. Connect TRAN1 to ⟨H4⟩ for 460 v units. Connect to ⟨H3⟩ for 230 v units. If 208/230 v units are run with a 208 v power supply connect to ⟨H2⟩ .
2. Connect TRAN2 to BLK lead for 460 v units. Connect to ORN lead for 230 v units. If 208/230 v units are run with a 208 v power supply connect to RED lead.
3. Circuit breaker must trip amps are equal to or less than 156% FLA (Full Load Amps) for CB1 and CB2. All others are 140%.
4. If any of the original wire furnished must be replaced, it must be replaced with type 90° C wire or its equivalent.
5. Number(s) indicates the line location of contacts. A bracket over (2) numbers signifies single-pole double-throw contacts. An underlined number signifies a normally closed contact. Plain number(s) (no lines), signifies a normally opened contact.
6. Condenser-fan motors are thermally protected.
7. Three-phase motors are protected under primary single phasing conditions.

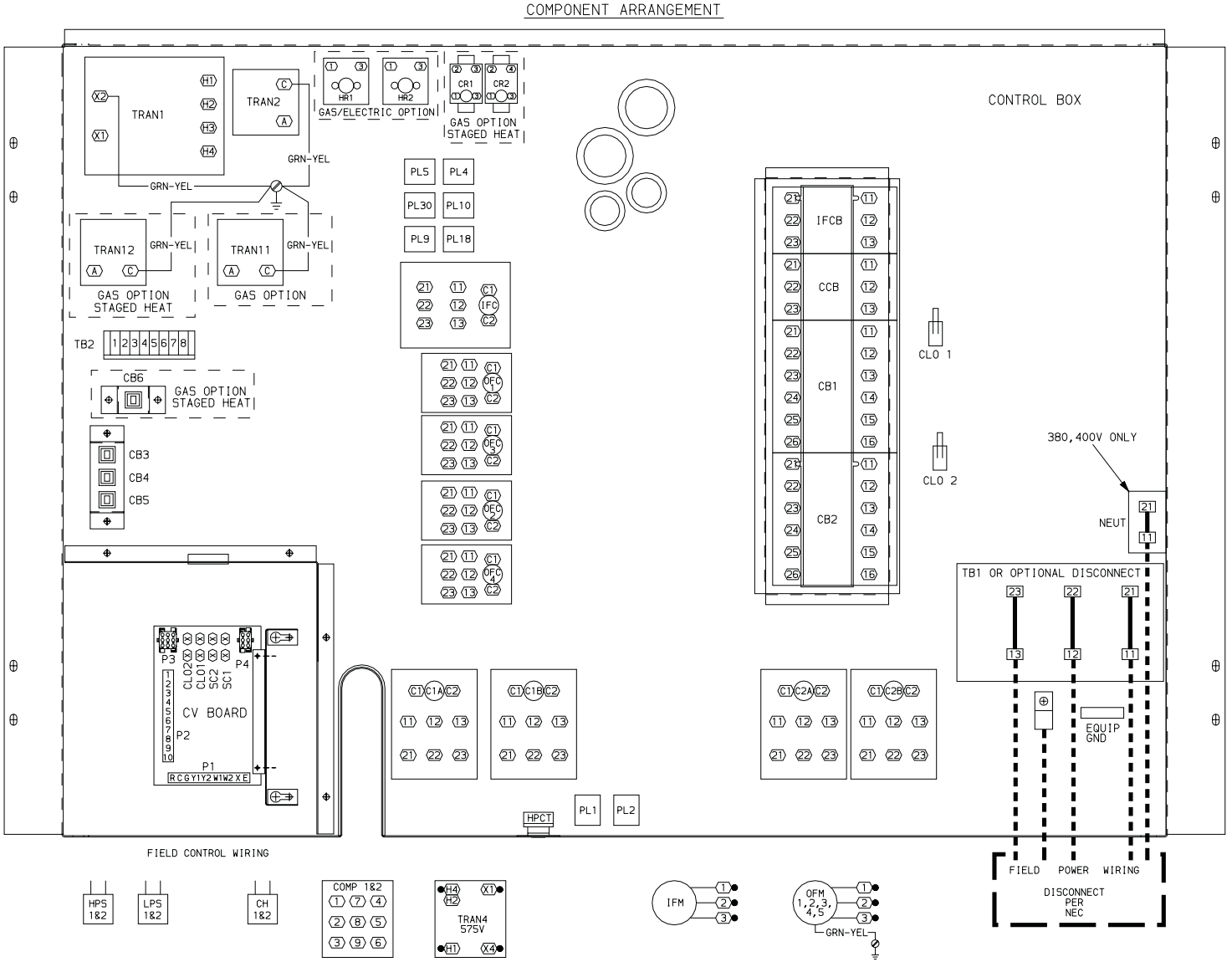


Fig. 141 — Component Arrangement, Constant Volume Units, Sizes 055-070 Shown

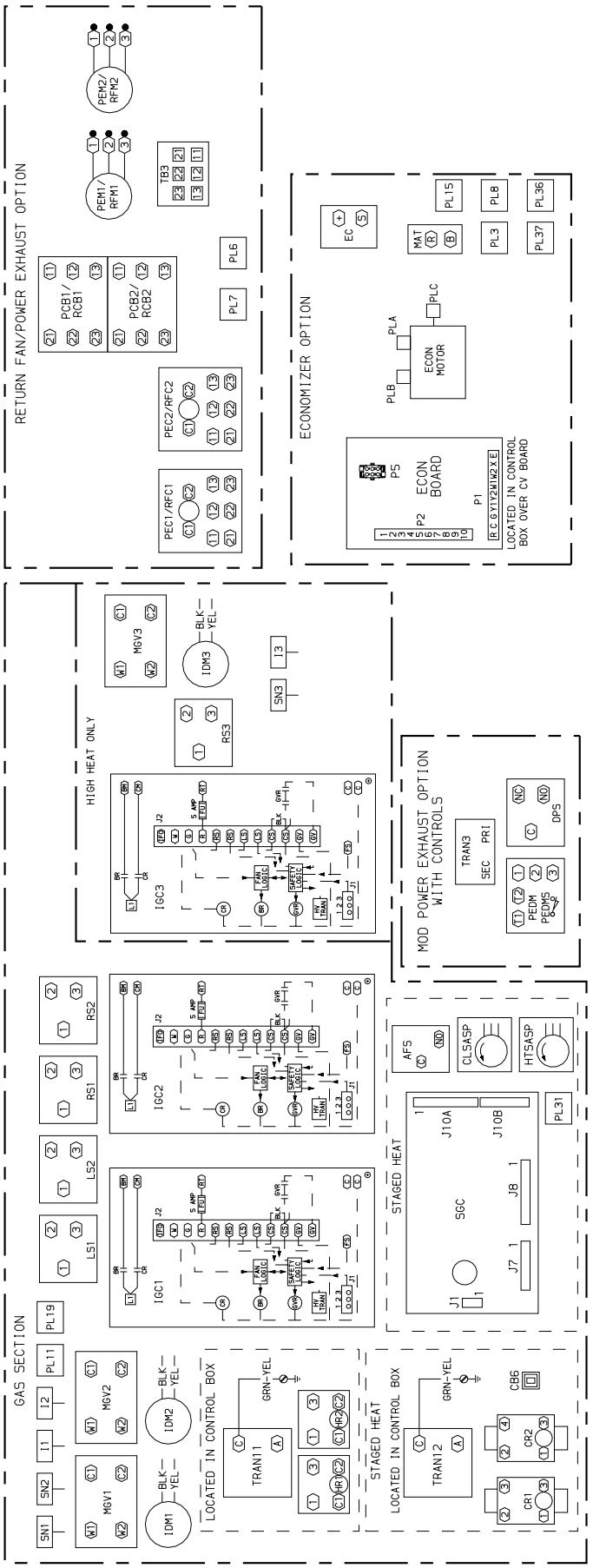


Fig. 141 — Component Arrangement, Constant Volume Units, Sizes 055-070 Shown (cont)

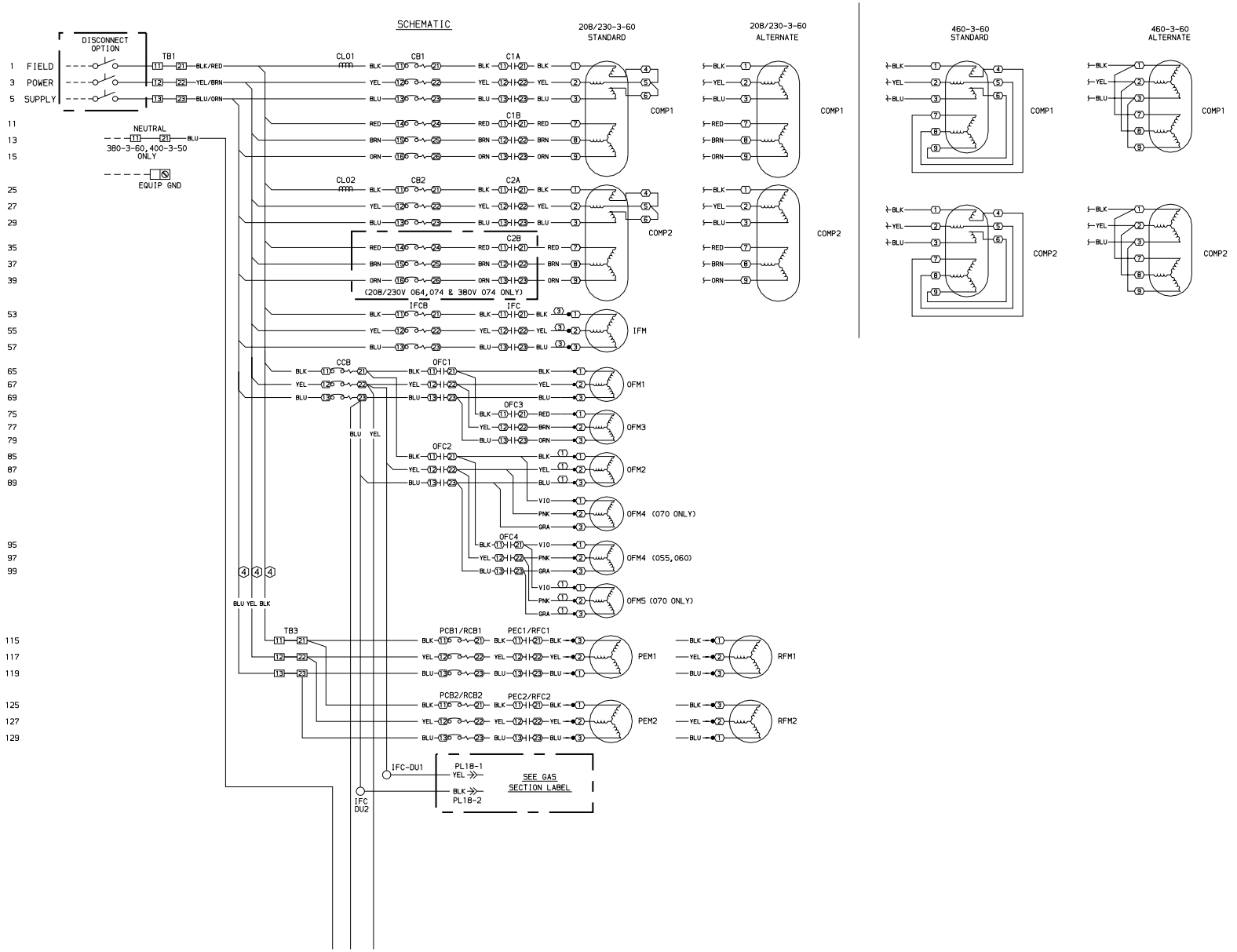


Fig. 142 — Label Diagram, Constant Volume Units, Sizes 055-070 Shown

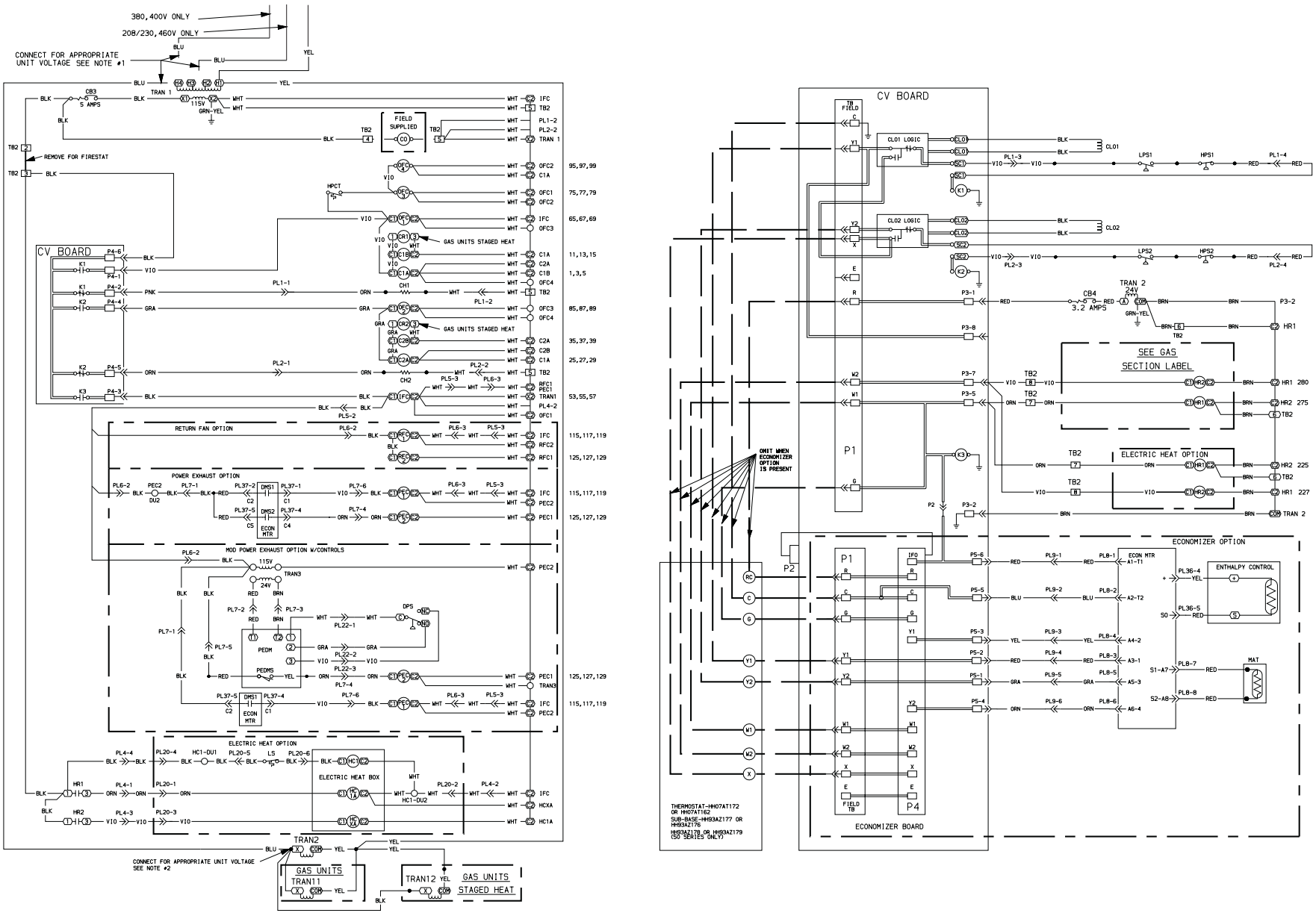


Fig. 142 — Label Diagram, Constant Volume Units, Sizes 055-070 Shown (cont)

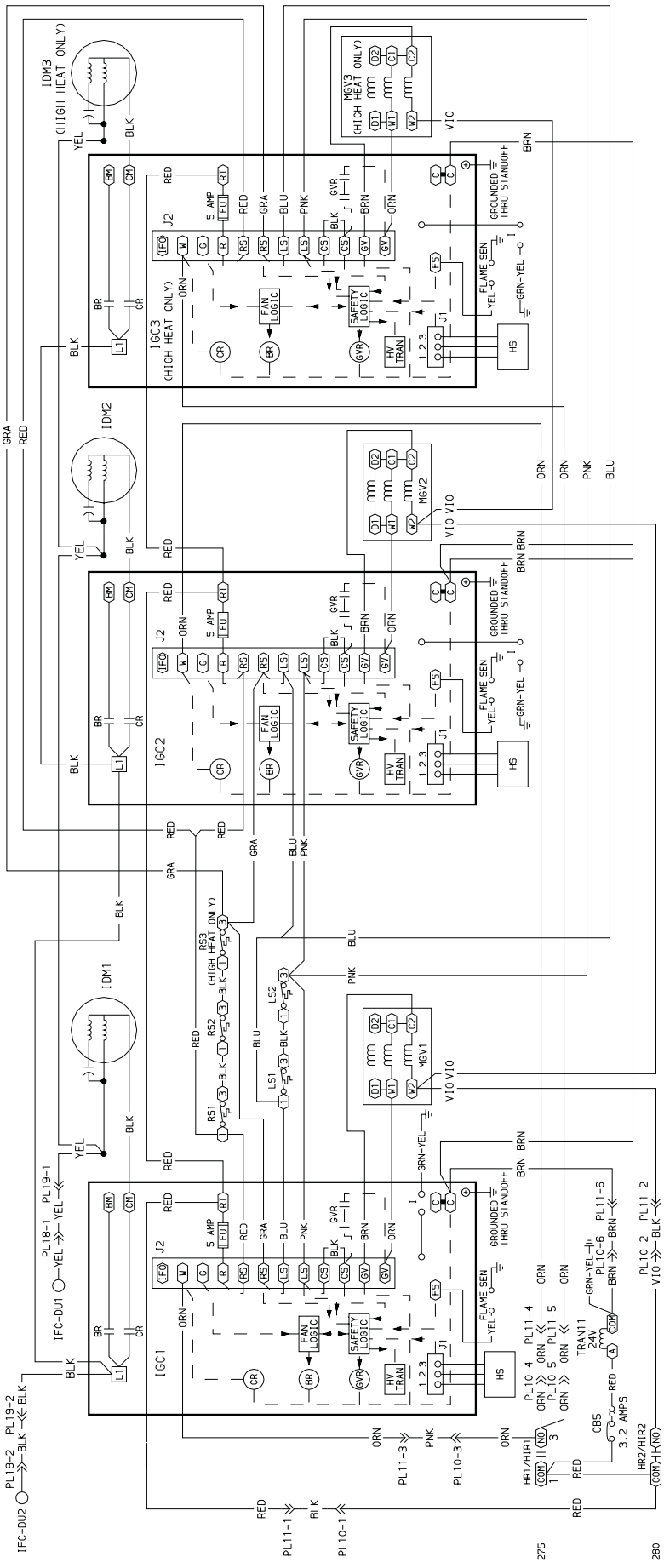


Fig. 143 — Label Diagram, Gas Sections, Sizes 055-070 Shown

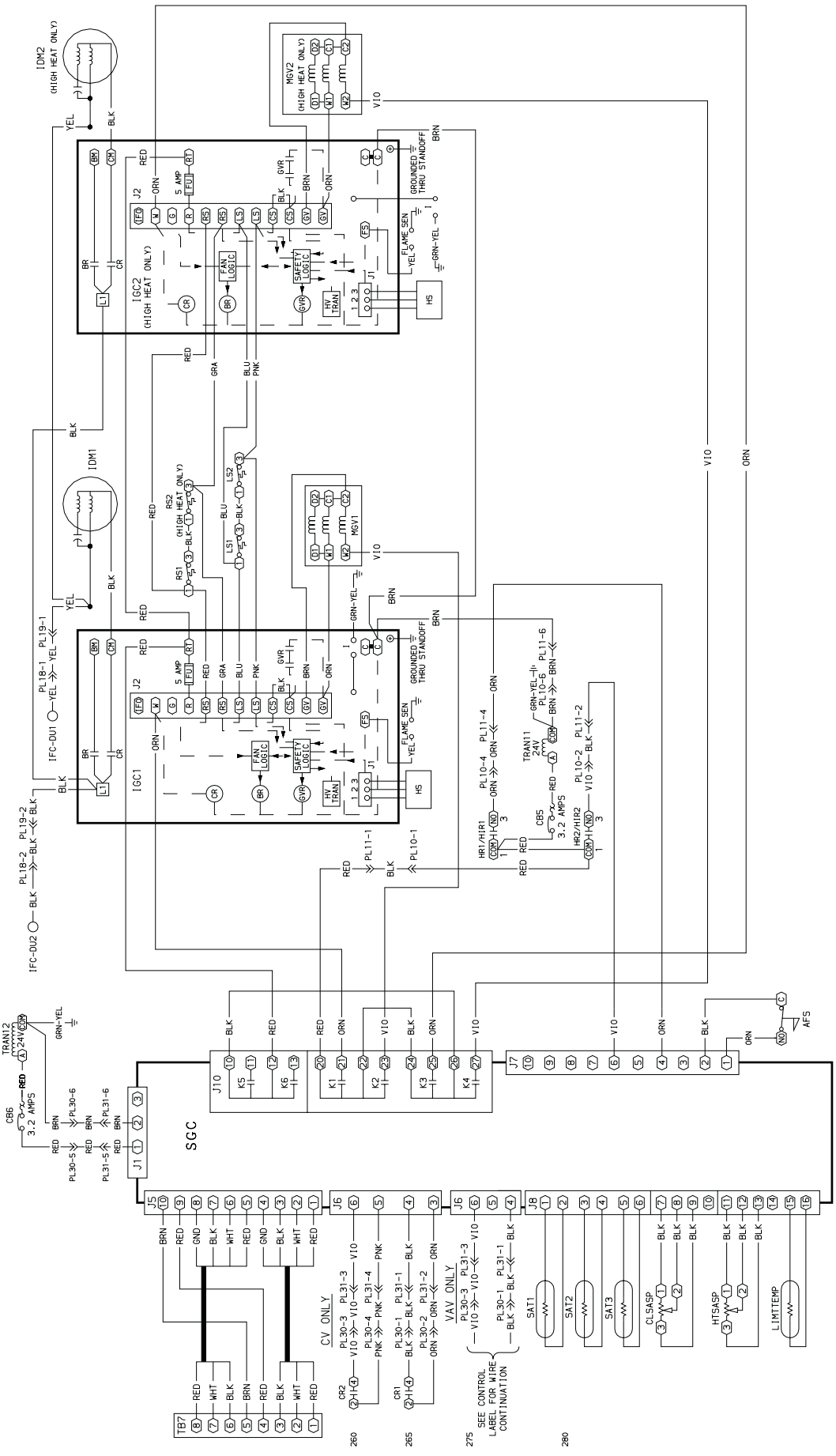


Fig. 144 — Label Diagram, Staged Gas Sections, Sizes 030-050

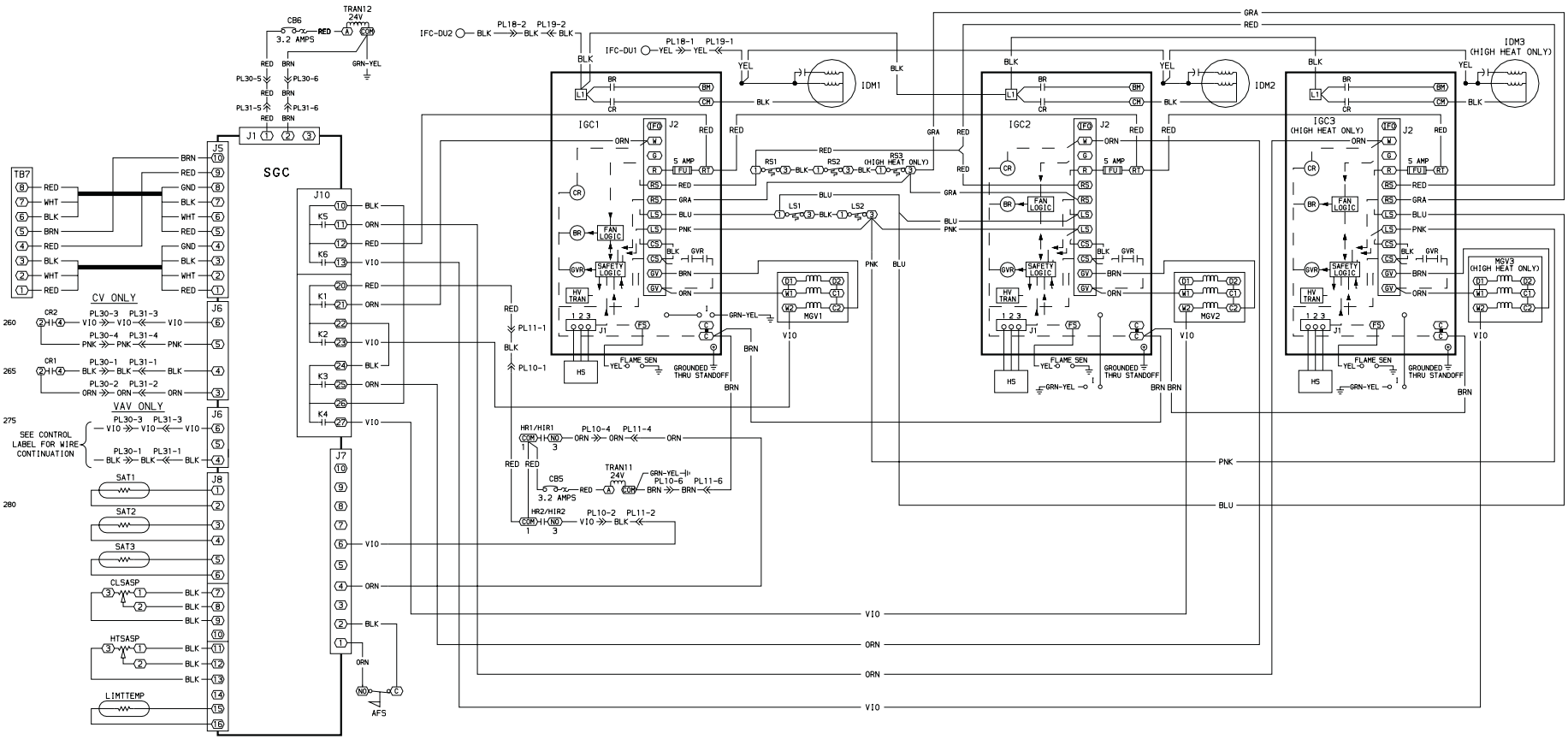


Fig. 145 — Label Diagram, Staged Gas Sections, Sizes 055-105

Copyright 2002 Carrier Corporation

START-UP CHECKLIST

MODEL NO.:_____ SERIAL NO.: _____

DATE: _____ TECHNICIAN: _____

PRE-START-UP:

- ☐ VERIFY THAT UNIT IS LEVEL
- ☐ VERIFY THAT ALL PACKING MATERIALS HAVE BEEN REMOVED FROM UNIT
- ☐ LOOSEN ALL SHIPPING HOLDDOWN BOLTS AND REMOVE SHIPPING BRACKETS PER INSTRUCTIONS
- ☐ VERIFY THAT COMPRESSOR SUSPENSION SPRINGS HAVE BEEN LOOSENED PER INSTRUCTIONS
- ☐ VERIFY OPENING OF ECONOMIZER HOODS
- ☐ VERIFY INSTALLATION OF EXHAUST HOODS
- ☐ VERIFY INSTALLATION OF FLUE HOODS AND GAS SECTION INLET HOODS
- ☐ VERIFY THAT CONDENSATE CONNECTIONS ARE INSTALLED PER INSTRUCTIONS
- ☐ VERIFY THAT POWER SUPPLY MATCHES UNIT DATA PLATE
- ☐ VERIFY THAT ALL ELECTRICAL CONNECTIONS AND TERMINALS ARE TIGHT
- ☐ CHECK THAT INDOOR-AIR FILTERS ARE CLEAN AND IN PLACE
- ☐ CHECK FAN WHEEL AND PROPELLER FOR LOCATION IN HOUSING/ORIFICE, AND VERIFY SET SCREWS ARE TIGHT
- ☐ CHECK GAS PIPING FOR LEAKS
- ☐ VERIFY THAT FAN SHEAVES ARE ALIGNED AND BELTS ARE PROPERLY TENSIONED
- ☐ OPEN SUCTION, DISCHARGE, AND LIQUID LINE SERVICE VALVES
- ☐ CHECK COMPRESSOR OIL LEVEL SIGHT GLASS AND VERIFY PROPER LEVEL
- ☐ VERIFY THAT CRANKCASE HEATERS HAVE BEEN ENERGIZED FOR 24 HOURS
- ☐ CHECK VOLTAGE IMBALANCE

LINE-TO-LINE VOLTS: AB _____ V AC _____ V BC _____ V

(AB + AC + BC)/3 = AVERAGE VOLTAGE = _____ V

MAXIMUM DEVIATION FROM AVERAGE VOLTAGE = _____ V

VOLTAGE IMBALANCE = 100 X (MAX DEVIATION)/(AVERAGE VOLTAGE) = _____ %

IF OVER 2% VOLTAGE IMBALANCE, DO NOT ATTEMPT TO START SYSTEM!
CALL LOCAL POWER COMPANY FOR ASSISTANCE.

START-UP

CHECK SUPPLY FAN SPEED AND RECORD. _____

CHECK CONDENSER FAN SPEED AND RECORD. _____

AFTER AT LEAST 10 MINUTES RUNNING TIME, RECORD THE FOLLOWING MEASUREMENTS:

	COMP 1	COMP 2
OIL PRESSURE		
SUCTION PRESSURE		
SUCTION LINE TEMP		
DISCHARGE PRESSURE		
DISCHARGE LINE TEMP		
ENTERING CONDENSER AIR TEMP		
LEAVING CONDENSER AIR TEMP		
EVAP ENTERING AIR DB TEMP		
EVAP ENTERING AIR WB TEMP		
EVAP LEAVING AIR DB TEMP		
EVAP LEAVING AIR WB TEMP		
COMPRESSOR AMPS (L1)		
COMPRESSOR AMPS (L2)		
COMPRESSOR AMPS (L3)		

ELECTRICAL

SUPPLY FAN AMPS _____ EXHAUST FAN AMPS _____

ELECTRIC HEAT AMPS L1 _____ L2 _____ L3 _____

TEMPERATURES

OUTDOOR-AIR TEMPERATURE _____ F DB (Dry-Bulb)

RETURN-AIR TEMPERATURE _____ F DB _____ F WB (Wet-Bulb)

COOLING SUPPLY AIR _____ F

GAS HEAT SUPPLY AIR _____ F

PRESSURES

GAS INLET PRESSURE _____ IN. WG

REFRIGERANT SUCTION CIRCUIT NO. 1 _____ PSIG CIRCUIT NO. 2 _____ PSIG

REFRIGERANT DISCHARGE CIRCUIT NO. 1 _____ PSIG CIRCUIT NO. 2 _____ PSIG

GAS MANIFOLD PRESSURE VALVE NO. 1 _____ IN. WG VALVE NO. 2 _____ IN. WG

☐ VERIFY REFRIGERANT CHARGE USING CHARGING CHART ON PAGE 112.

GENERAL

☐ ECONOMIZER MINIMUM VENT AND CHANGEOVER SETTINGS TO JOB REQUIREMENTS

CHECK THE COMPRESSOR OIL LEVEL SIGHT GLASSES; ARE THE SIGHT GLASSES SHOWING OIL LEVEL PER INSTRUCTIONS ON PAGE 83. (Y/N) _____

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

Copyright 2002 Carrier Corporation